

Online Appendix: Small Area Consumption Estimates Combining Survey and Financial Footprints Data

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Appendices

A Regression results

Table A1: Regression Results: consumption excluding housing (C1)

Variable	Estimate	Std. Error	t value
Intercept	-0.367	0.322	-1.142
Dummy: Household contains an U14 individual	0.050	0.033	1.512
Dummy: Household contains an individual aged 14-18	0.047	0.068	0.686
Dummy: Household contains >1 adult	0.444	0.023	18.996
Number of U14s in household	0.027	0.017	1.602
Number of 14-18 in household	0.104	0.055	1.905
Number of additional adults	0.229	0.014	15.899
Sex of household head	0.008	0.014	0.599
MSOA-level log of average account spending (from Natwest data)	0.337	0.031	10.911
Dummy: household head finished education between 18 and 21	0.145	0.021	7.058
Dummy: household head finished education aged over 21	0.188	0.021	9.154
Dummy: household head is still in education	0.273	0.065	4.183
Ethnicity: White	0.180	0.045	4.034
Ethnicity: Asian/Asian British	-0.143	0.055	-2.612
Ethnicity: Black African/Caribbean/Black British	-0.177	0.065	-2.735
Dummy: Household Head is aged 30-40	0.020	0.030	0.669
Dummy: Household Head is aged 40-50	0.042	0.030	1.377
Dummy: Household Head is aged 50-60	-0.010	0.031	-0.333
Dummy: Household Head is aged 60-70	-0.086	0.033	-2.633
Dummy: Household Head is aged 70+	-0.259	0.034	-7.710
HH is mortgager	0.526	0.018	29.793
HH is owner	0.585	0.019	30.131
LAD-median electricity consumption (in log KWH)	0.018	0.021	0.861
Log median house price in local authority	0.124	0.020	6.193
Dummy: observation is from 2018	-0.027	0.014	-2.018
Individual error variance	0.362		
Random error variance	0.004		
LR test of random effects model (p-value)	11.064 (<0.001)		
Sample size	8744		

Notes: These parameter estimates correspond to a random effects regression of log consumption excluding housing-related expenditure on covariates and a local-authority random effect. It was estimated on a sample of 8744 households from the 2018 and 2019 Living Costs and Food Survey. The LR test is the likelihood ratio test statistic obtained from testing the random effects model against a linear model omitting the random area effect. The omitted reference ethnicity is 'Other ethnic group', and the omitted age of household head group is 'Household Head is aged 18-30'.

Table A2: Regression Results: consumption including housing (C2)

Variable	Estimate	Std. Error	t value
Intercept	-1.065	0.214	-4.982
Dummy: Household contains an U14 individual	0.034	0.019	1.751
Dummy: Household contains an individual aged 14-18	0.006	0.040	0.139
Dummy: Household contains >1 adult	0.235	0.014	17.278
Number of U14s in household	0.026	0.010	2.640
Number of 14-18 in household	0.089	0.032	2.786
Number of additional adults	0.163	0.008	19.463
Sex of household head	0.002	0.008	0.203
MSOA-level log of average account spending (from Natwest data)	0.199	0.019	10.720
Dummy: household head finished education between 18 and 21	0.094	0.012	7.853
Dummy: household head finished education aged over 21	0.123	0.012	10.283
Dummy: household head is still in education	0.177	0.038	4.644
Ethnicity: White	0.089	0.026	3.410
Ethnicity: Asian/Asian British	-0.099	0.032	-3.115
Ethnicity: Black African/Caribbean/Black British	-0.076	0.038	-2.020
Dummy: Household Head is aged 30-40	0.034	0.018	1.930
Dummy: Household Head is aged 40-50	0.064	0.018	3.628
Dummy: Household Head is aged 50-60	0.057	0.018	3.159
Dummy: Household Head is aged 60-70	0.026	0.019	1.388
Dummy: Household Head is aged 70+	-0.082	0.020	-4.197
HH is mortgager	0.363	0.010	35.228
HH is owner	0.393	0.011	34.688
LAD-median electricity consumption (in log KWH)	-0.003	0.013	-0.196
Log median house price in local authority	0.372	0.014	26.478
Dummy: observation is from 2018	-0.011	0.008	-1.329
Individual error variance	0.121		
Random error variance	0.005		
LR test of random effects model (p-value)	98.94 (<0.001)		
Sample size	8744		

Notes: These parameter estimates correspond to a random effects regression of log consumption including housing-related expenditure on covariates and a local-authority random effect. It was estimated on a sample of 8744 households from the 2018 and 2019 Living Costs and Food Survey. The LR test is the likelihood ratio test statistic obtained from testing the random effects model against a linear model omitting the random area effect. The omitted reference ethnicity is 'Other ethnic group', and the omitted age of household head group is 'Household Head is aged 18-30'.

Table A3: Regression Results: deflated consumption including housing (C3)

Variable	Estimate	Std. Error	t value
Intercept	2.362	0.189	12.463
Dummy: Household contains an U14 individual	0.034	0.019	1.780
Dummy: Household contains an individual aged 14-18	0.005	0.040	0.123
Dummy: Household contains >1 adult	0.239	0.014	17.647
Number of U14s in household	0.027	0.010	2.708
Number of 14-18 in household	0.092	0.032	2.893
Number of additional adults	0.161	0.008	19.252
Sex of household head	0.003	0.008	0.360
MSOA-level log of average account spending (from Natwest data)	0.217	0.018	12.057
Dummy: household head finished education between 18 and 21	0.092	0.012	7.725
Dummy: household head finished education aged over 21	0.120	0.012	10.04
Dummy: household head is still in education	0.177	0.038	4.670
Ethnicity: White	0.109	0.026	4.187
Ethnicity: Asian/Asian British	-0.100	0.032	-3.152
Ethnicity: Black African/Caribbean/Black British	-0.076	0.037	-2.021
Dummy: Household Head is aged 30-40	0.035	0.017	2.001
Dummy: Household Head is aged 40-50	0.064	0.018	3.623
Dummy: Household Head is aged 50-60	0.058	0.018	3.257
Dummy: Household Head is aged 60-70	0.027	0.019	1.444
Dummy: Household Head is aged 70+	-0.082	0.019	-4.194
HH is mortgager	0.365	0.010	35.642
HH is owner	0.397	0.011	35.205
LAD-median electricity consumption (in log KWH)	0.026	0.012	2.131
Log median house price in local authority	0.071	0.012	5.996
Dummy: observation is from 2018	-0.021	0.008	-2.608
Individual error variance	0.121		
Random error variance	0.002		
LR test of random effects model (p-value)	16.569 (<0.001)		
Sample size	8744		

Notes: These parameter estimates correspond to a random effects regression of log deflated consumption on covariates and a local-authority random effect. It was estimated on a sample of 8744 households from the 2018 and 2019 Living Costs and Food Survey. The LR test is the likelihood ratio test statistic obtained from testing the random effects model against a linear model omitting the random area effect. The omitted reference ethnicity is 'Other ethnic group', and the omitted age of household head group is 'Household Head is aged 18-30'.

B Estimates by tenure type

In this section, we present estimates of non-housing consumption estimated separately by tenure type (for renters in private housing, renters in social housing and owner-occupiers). On average, owners spend more than private renters (unweighted average across areas of £301 vs £220), who spend more than renters in social housing (£165).

In Figures B1, B2 and B3, we plot pairwise comparisons of mean consumption across tenure types for a given local authority. Manchester constitutes an interesting example to highlight the importance of studying differences across tenure types. Private renters in Manchester are far better off in relative terms (at the 70th percentile of the geographical renters distribution) compared with owners (at the 7th percentile of the owners distribution) and renters in social housing (at the 8th percentile). One possibility is that the low consumption of owner-occupiers in Manchester reflects the expectation of high future house price growth, which induces recent mortgagers to allocate a greater share of their budget to housing to increase future consumption. Alternatively, the high consumption of renters may reflect labour-market-driven selection, with Manchester attracting young professionals with high expected lifetime incomes who are disproportionately likely to rent. The lower rank of households in social housing may reflect a particularly strongly selected set of private renters in the area.

Within London, there is substantial variation across local authorities in the relative consumption of renters and owners, with renters in Newham and Hillingdon (ranked at the 43rd and 73rd percentile of the renter distribution respectively) consuming more in relative terms than owners (ranked at the 3rd and 47th percentiles of the owner distribution). In contrast, renters in Croydon and Haringey (ranked at the 70th and 72nd percentile) rank below their owner-occupying counterparts (at the 80th and 90th percentile).

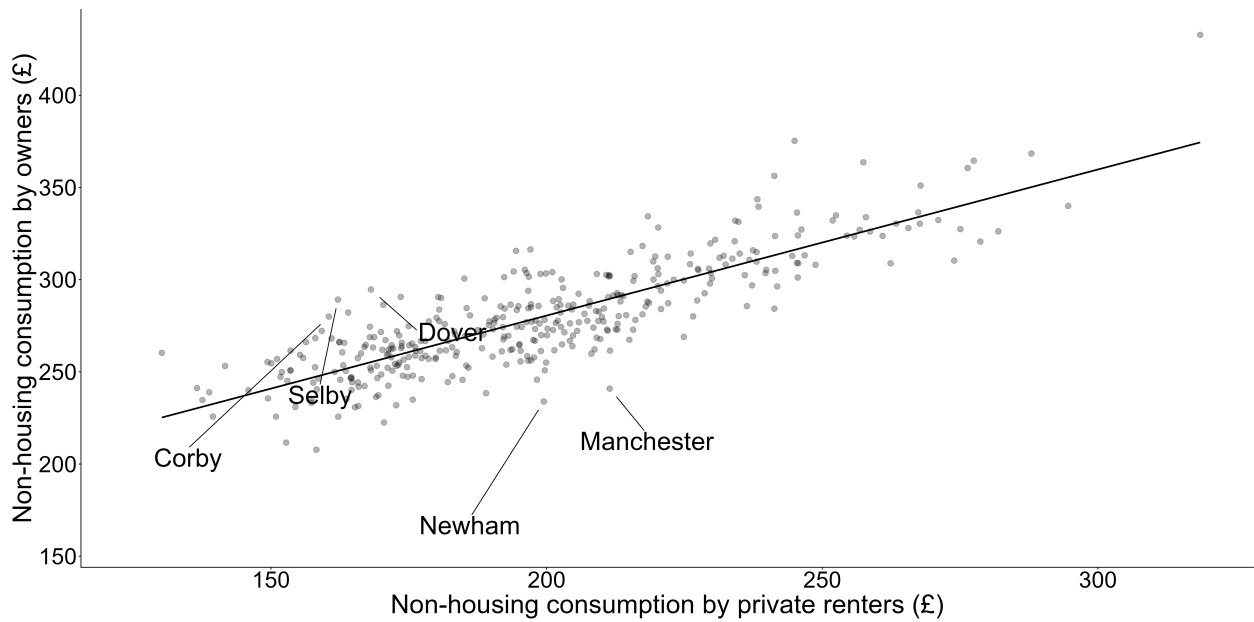


Figure B1: Owners vs private renters - non-housing consumption

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

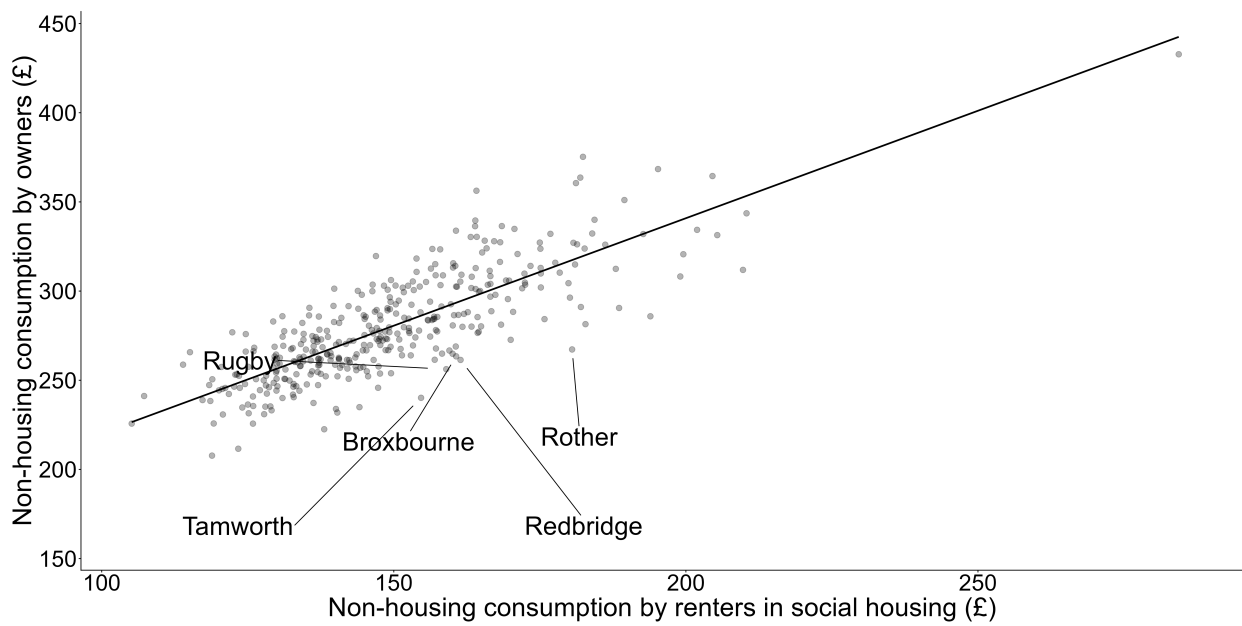


Figure B2: Owners vs renters in social housing - non-housing consumption

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

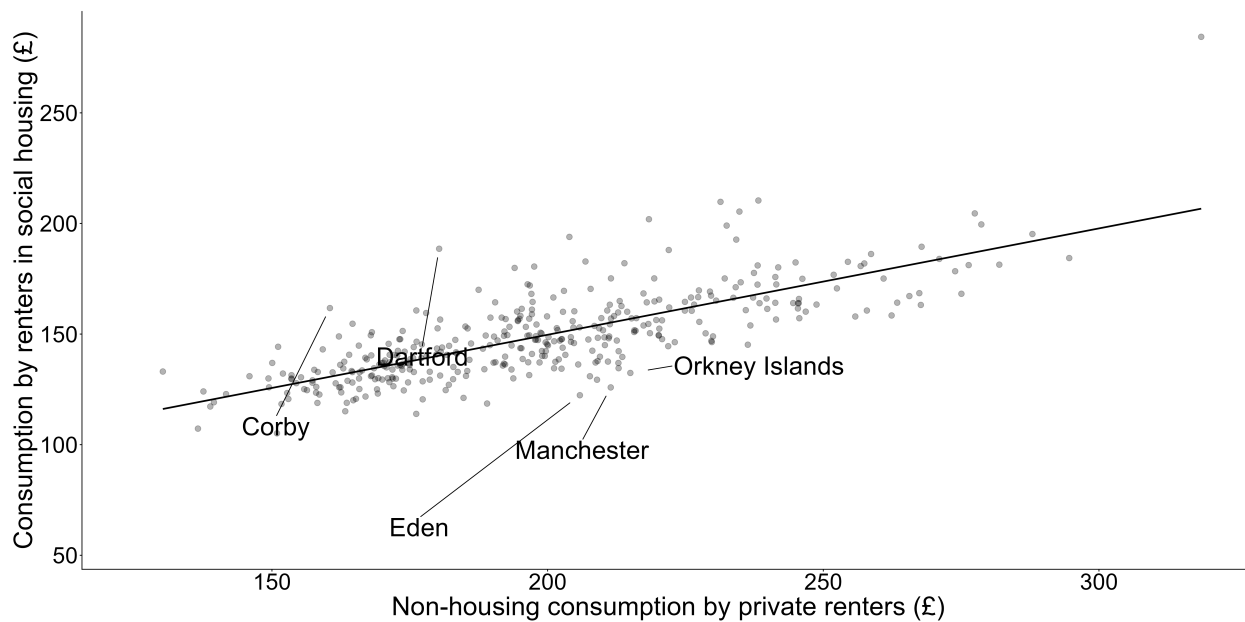


Figure B3: Private renters vs renters in social housing - non-housing consumption

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

C Additional Tables and Figures

Table C1: Covariate Balance

Variable	LCFS Sample Mean	APS Sample Mean
Number of U14s in household	0.42	0.41
Number of 14-18 in household	0.10	0.11
Number of additional adults	0.84	0.85
Sex of household head	0.61	0.59
Share in social housing	0.15	0.17
Ethnicity: White	0.92	0.91
Ethnicity: Asian/Asian British	0.04	0.04
Ethnicity: Black African/Caribbean/Black British	0.02	0.02
Ethnicity: Other Ethnic Group	0.02	0.02
Dummy: HH Head is aged 18-30	0.07	0.07
Dummy: HH Head is aged 30-40	0.16	0.15
Dummy: HH Head is aged 40-50	0.17	0.17
Dummy: HH Head is aged 50-60	0.19	0.2
Dummy: HH Head is aged 60-70	0.18	0.18
Dummy: HH Head is aged 70+	0.22	0.23
Dummy: HH is mortgager	0.32	0.3
Dummy: HH is owner	0.38	0.38
Dummy: HH is renter	0.3	0.32
LAD-median electricity consumption (in log KWH)	2.96	2.9
Share of sample who are renters in non social housing	0.15	0.15
Log median house price in local authority	12.28	12.22
MSOA-level log of average card spending (from Natwest data)	10.18	10.15
Dummy: HH Head finished education under 18	0.57	0.59
Dummy: HH Head finished education between 18 and 21	0.2	0.2
Dummy: HH Head finished education aged over 21	0.21	0.2
Dummy: HH Head still in education	0.02	0.01

Notes: This table contains mean values of covariates in the APS and LCFS samples used when estimating area-level mean consumption.

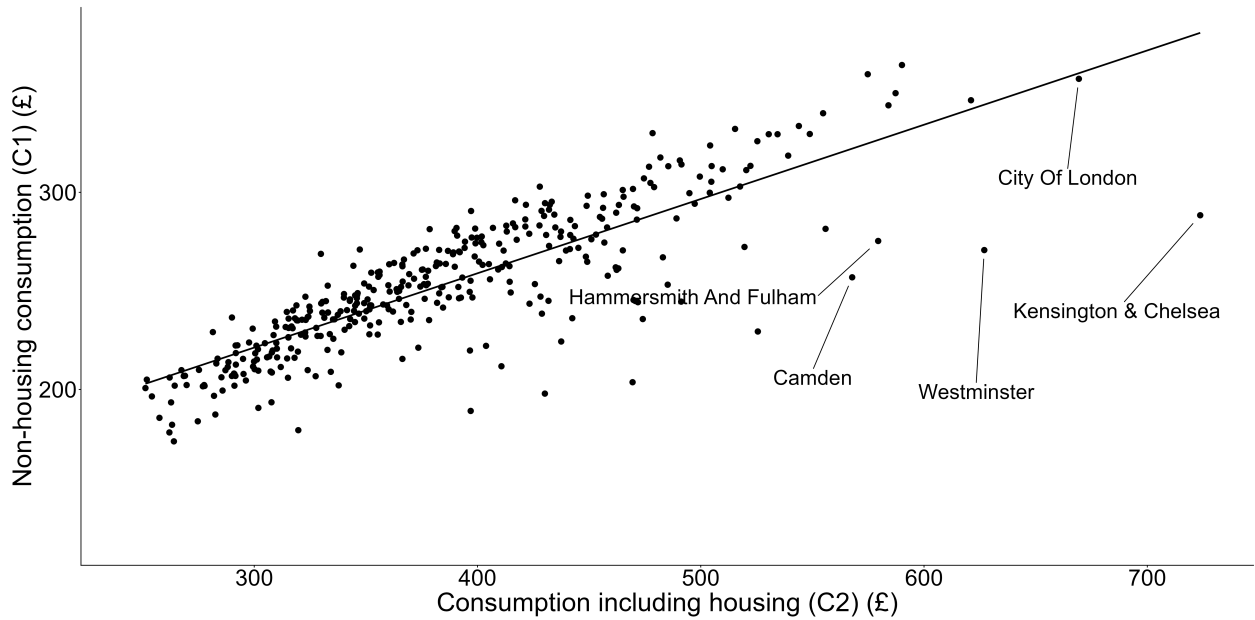


Figure C1: Consumption excluding housing (C1) versus consumption including housing-related expenditures (C2)

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

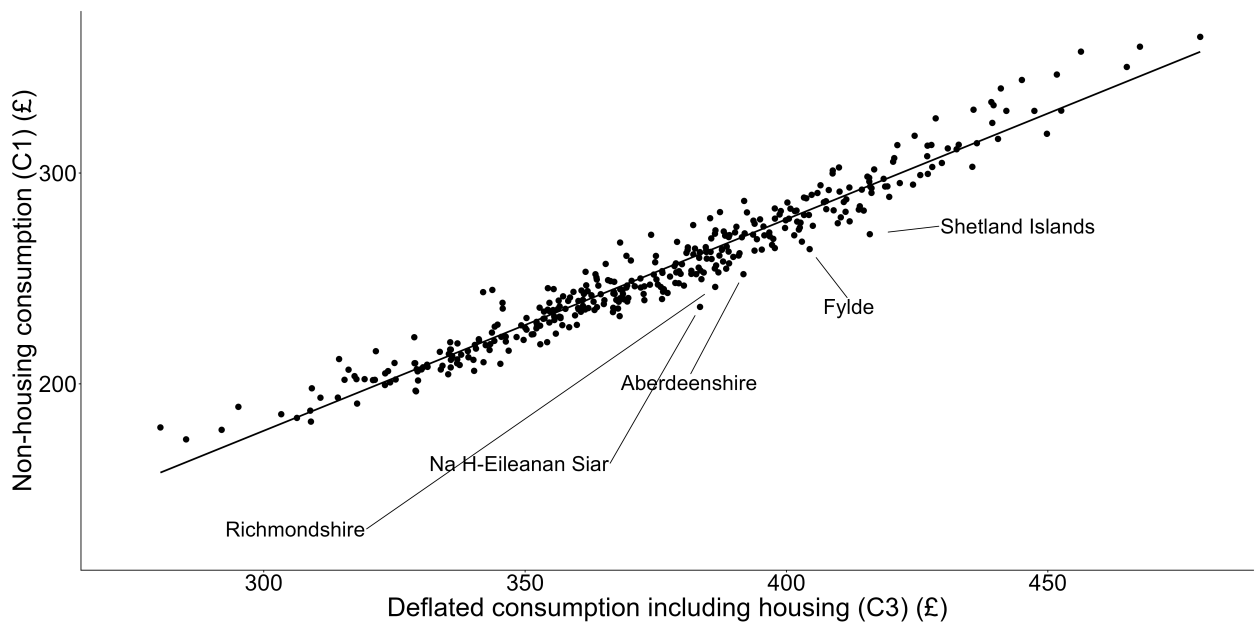


Figure C2: Consumption excluding housing (C1) versus deflated consumption (C3)

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

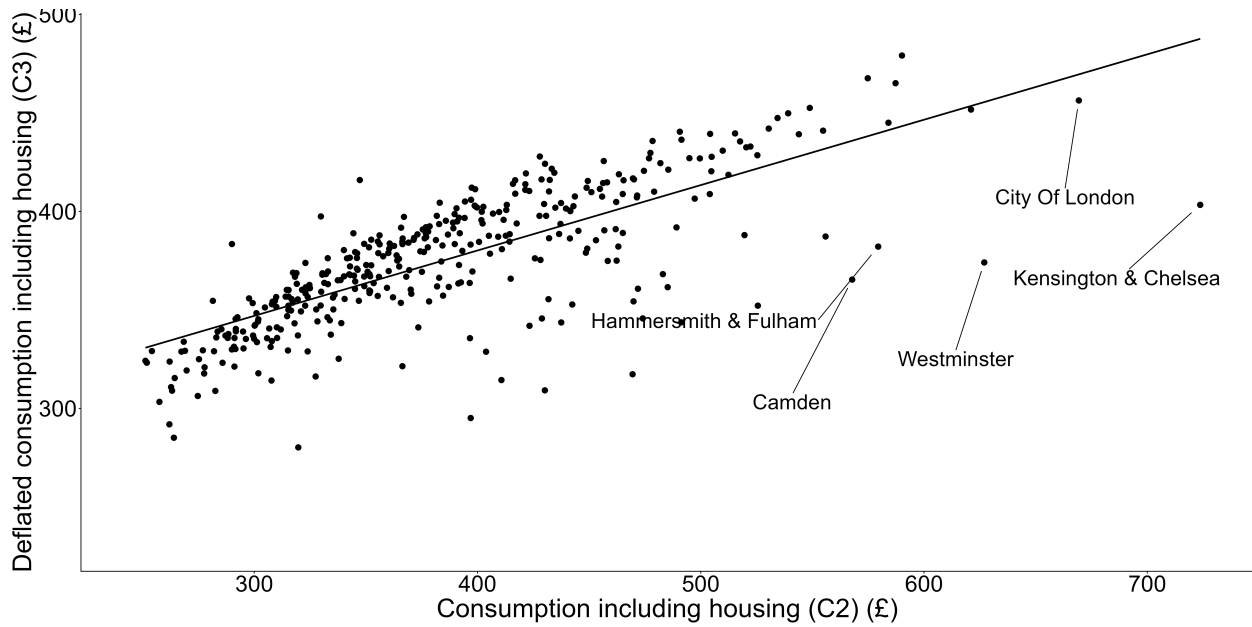


Figure C3: Consumption including housing (C2) versus deflated consumption (C3)

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.



Figure C4: Equivalised Consumption excluding housing (C1) vs per-capita income - ranks

Notes: We label the five local authorities with the largest absolute disparity in rank between the two measures.

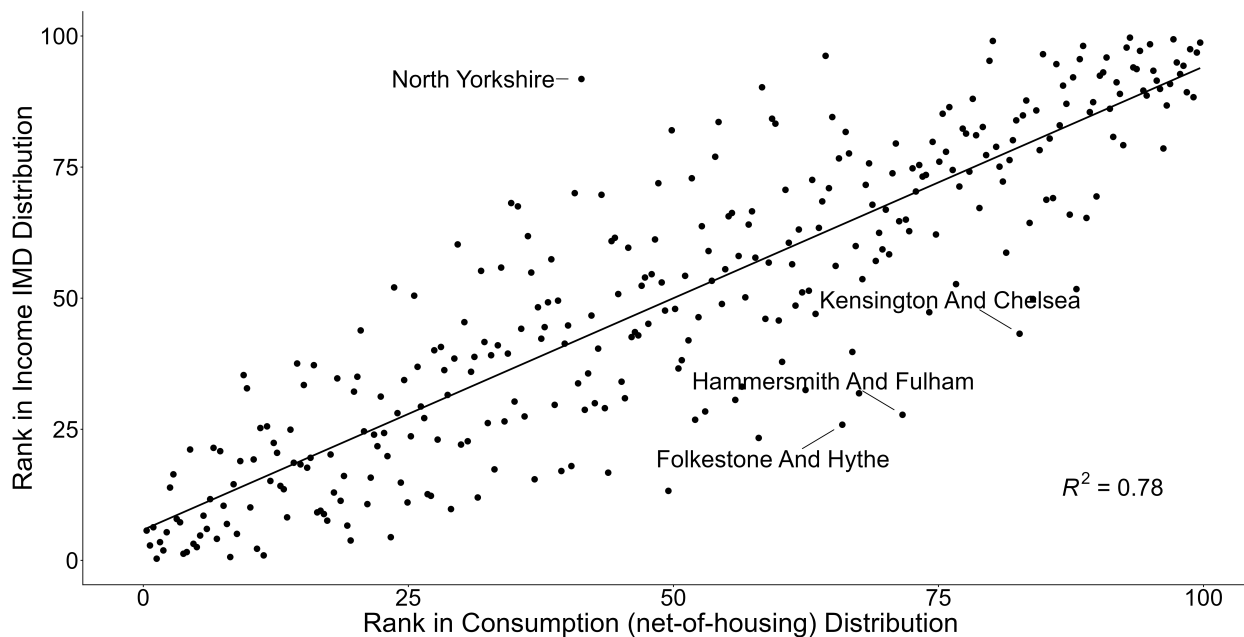


Figure C5: Equivalised Consumption excluding housing (C1) vs Income IMD - ranks

Notes: The Index of Multiple Deprivation is only available for English local authorities. We label the four local authorities with the largest absolute disparity in rank between the two measures.

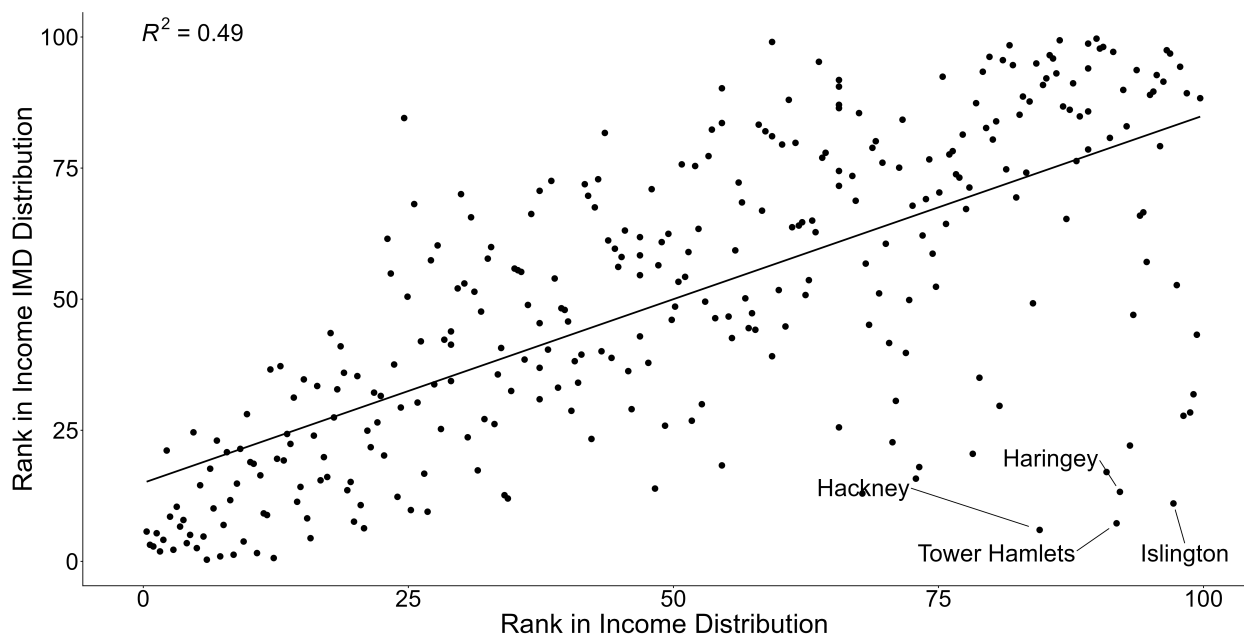


Figure C6: GDHI Income vs Income IMD - ranks

Notes: The Index of Multiple Deprivation is only available for English local authorities. We label the four local authorities with the largest absolute disparity in rank between the two measures.

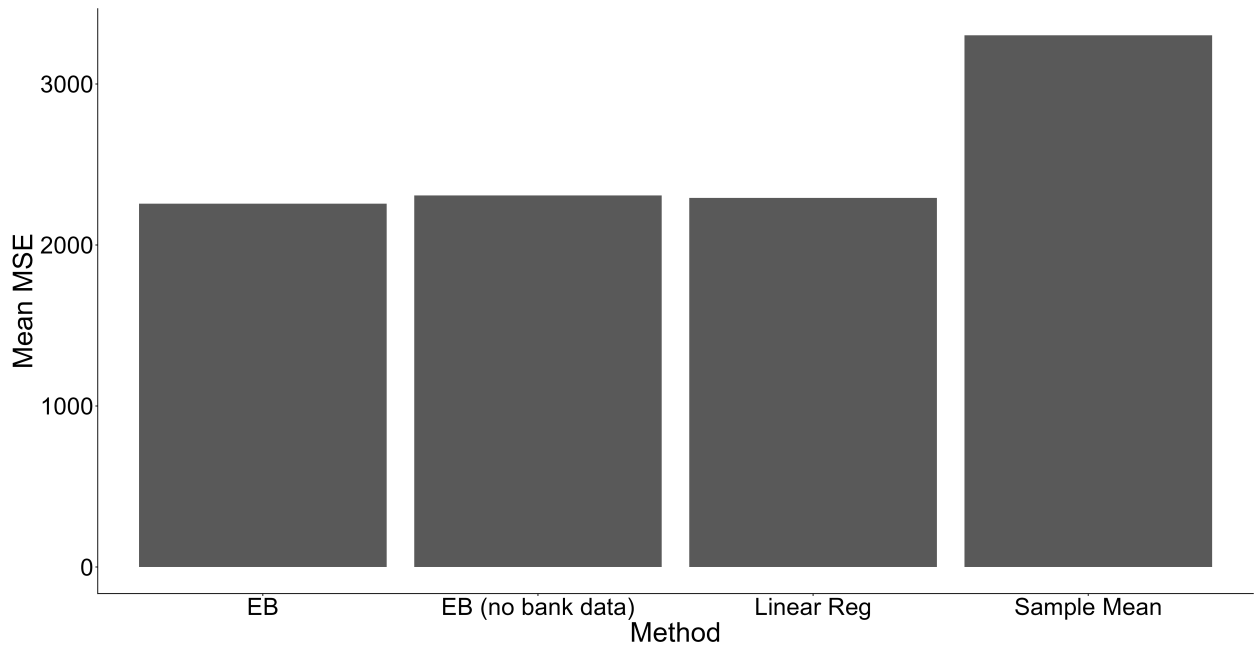


Figure C7: Average area-level MSE by method: hold-out sample estimator

Notes: Results are for average consumption including housing, deflated according to local prices (C3).

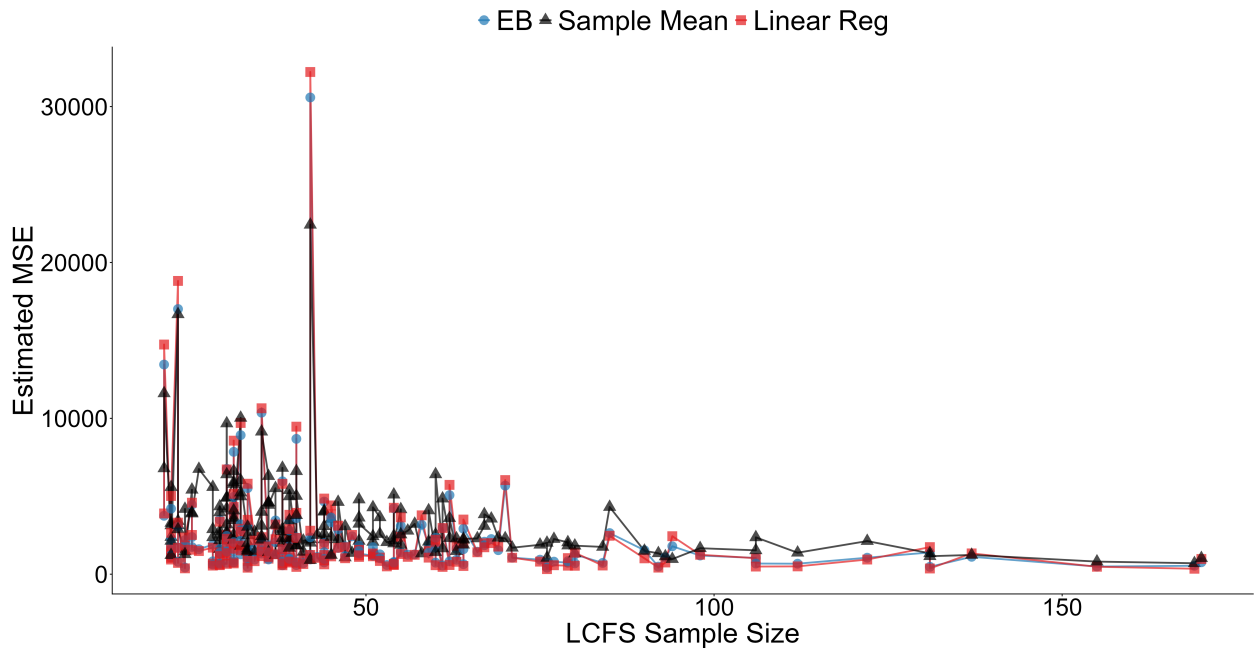


Figure C8: Area-Level MSE, by Method - hold-out sample estimator

Notes: Results are for average consumption including housing, deflated according to local prices (C3). To avoid potential disclosure, we omit areas with sample sizes less than 10.

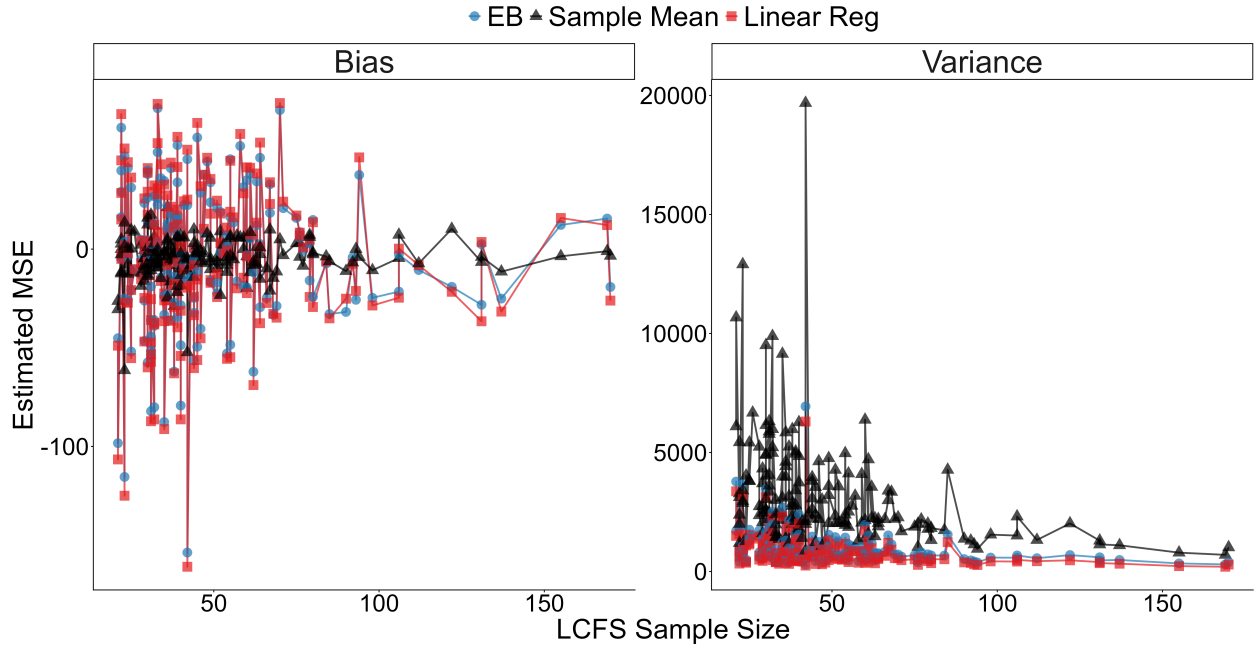


Figure C9: Area-Level Decomposition of MSE, by Method - hold-out sample estimator

Notes: Results are for average consumption including housing, deflated according to local prices (C3). To avoid potential disclosure, we omit areas with sample sizes less than 10.

	C1	C2	C3	Income IMD	GDHI Income	EB-estimated Income
C1	1.000	0.845	0.975	0.882	0.802	0.880
C2	0.845	1.000	0.776	0.687	0.912	0.935
C3	0.975	0.776	1.000	0.889	0.741	0.826
Income IMD	0.882	0.687	0.889	1.000	0.701	0.770
GDHI Income	0.802	0.912	0.741	0.701	1.000	0.903
EB-estimated Income	0.880	0.935	0.826	0.770	0.903	1.000

Table C2: Spearman Correlation Matrix of local authorities by consumption, Income IMD, EB-estimated income and GDHI Income.

Notes: C1 is consumption excluding housing expenditures, C2 includes nominal housing expenditures, C3 is deflated using estimates of local housing costs. The Index of Multiple Deprivation is only available for English local authorities, so all correlations are based on the subsample of English local authorities only.

Table C3: Local authority mapping for unmerged areas

	LA in Consumption Data	LA in Income data
1	Richmondshire	North Yorkshire
2	Craven	North Yorkshire
3	Corby	North Northamptonshire
4	Ryedale	North Yorkshire
5	Wellingborough	North Northamptonshire
6	Daventry	West Northamptonshire
7	Kettering	North Northamptonshire
8	South Bucks	Buckinghamshire
9	East Northamptonshire	North Northamptonshire
10	Eden	Westmorland And Furness
11	South Northamptonshire	West Northamptonshire
12	Selby	North Yorkshire
13	Hambleton	North Yorkshire
14	Barrow-In-Furness	Westmorland And Furness
15	Copeland	Cumberland
16	Scarborough	North Yorkshire
17	Chiltern	Buckinghamshire
18	Mendip	Somerset
19	Allerdale	Cumberland
20	Sedgemoor	Somerset
21	South Lakeland	Westmorland And Furness
22	Carlisle	Cumberland
23	Harrogate	North Yorkshire
24	Northampton	West Northamptonshire
25	South Somerset	Somerset
26	Somerset West And Taunton	Somerset
27	Aylesbury Vale	Buckinghamshire
28	Wycombe	Buckinghamshire