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The evidence of urban-rural happiness gradient is mounting. urban unhappiness is common and some morrison stuff and couple others like 10 from that boilerplate in recent cities article about least happy places aroudn the world speicific cities but guess The urban-rural happiness gradient states that happiness raises from its lowest in largest cities to highest in smallest places, little towns, villages, and open country.

Yet all studies to date are cross sectional and panel evidence is missing. Few studies that use panel data do not actually test the gradient. Hoogerbrugge and Burger (????) use inadequate measurement, the urban-rural cutoff is at extremely low population size of 10,000 people or even 3,000 people for Scottland. Large villages and small towns are not really "urban" lacking defining features of urbanness: size, density, and heterogeneity Wirth (1938). The build envirnment in small towns lacks . The way of life lacks transitoriness, etc these words from city book. cite when metropolis is too big and urgan unhappiness is common–ideally it should be a gradient, and if necessarily a binary disctinction then it is several hundred thousand, not 3 or 10 thoudsand as in Hoogerbrugge and Burger (????).

White et al. (2013b) and White et al. (2013a) use British panel (BHPS) but test green space (such as gardens, parks, and proximity to coast) not size of a place. Similarly, Alcock et al. (2014) is a panel (BHPS) but also examining green space, not size of a place. Rehdanz and Maddison (2008) uses a German panel dataset (GSOEP), but without panel modelling techniques such as fixed or random effects.

1 Data and model

We use 2009-2019 psid from `psidonline.isr.umich.edu`, the reason being that swb question only started in 2009. from the family files we only retain household reference person (or head as it used to be called). This is the same practice as in (Brown and Gathergood 0).

the swb question reads: Please think about your life as a whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not very satisfied, or not at all satisfied? on scale from 1 (low) to 5 (high).

and the key independent variable is metro as defined in table 1.

Summary statistics are shown in Supplementary Online Material (SOM).

There are 3 vars that not only predict SWB, but also are likely to be confounded with metro: race, political views, and religiosity–yet, they are irrelevant in fixed effects model as they are constant over time.

panel structure description of metro variable is shown in the appendix yes one problem is that tehre is little variability in urb-rur

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I thank Gordon D. A. Brown for sharing STATA code. All mistakes are mine.

metro	beale rural-urban code	description
1	1	Metro: Counties in metro areas of 1 million population or more
1	2	Metro: Counties in metro areas of 250,000 to 1 million population
1	3	Metro: Counties in metro areas of fewer than 250,000 population
0	4	Nonmetro: Urban population of 20,000 or more, adjacent to a metro area
0	5	Nonmetro: Urban population of 20,000 or more, not adjacent to a metro area
0	6	Nonmetro: Urban population of 2,500 to 19,999, adjacent to a metro area
0	7	Nonmetro: Urban population of 2,500 to 19,999, not adjacent to a metro area
0	8	Nonmetro: Completely rural or less than 2,500 urban population, adjacent to a metro area
0	9	Nonmetro: Completely rural or less than 2,500 urban population, not adjacent to a metro area

Table 1: metro variable: Metropolitan/Non-metropolitan Indicator: This indicator is derived from the 2013 Beale-Ross Rural-Urban Continuum Codes published by USDA based on matches to the FIPS state and county codes: 1. Metropolitan area (Beale-Ross Code ER775923= 1-3); 0. Non-metropolitan area (Beale-Ross Code ER775923= 4-9). Each county in the U.S. is assigned one of the 9 codes.

controls are set in table **??** var_des in SOM

in controls we follow my cities when metropolis is too big (make sure we do):

race! cities more minorities and minorities less happy (berry US swb paper)

liberal democrat, rep con–cities more liberal/democract and democrats less happy my jap paper

it is impostrant to control for employment status–it both predicts swb, especially unmeployment has lasting negative effect on swb, and it also correlates with urbanicity as cities have more employment opportunities (e.g., O'Sullivan 2009).

boilerplate on linear models, no need for categorical dependent variable modeling, elaborate

a standard fixed effects model is given by:

$$SWB_{it} = \gamma METRO_{it} X_{it}\beta + \alpha_i + u_{it} \tag{1}$$

Where, $METRO_{it}$ is a metro dummy for person i at time t. γ is the main coefficient of interest. α_i (i=1...n) is the unknown intercept for each person(n person-specific intercepts). SWB is the dependent variable, where i = person and t = wave. X_{it} is a vector of control variables. β is the vector of coefficients for control variables. u_{it} is the error term.

A limitation of fixed effects model is that there are just 6 waves and tehre is limited variablility across time and hence time-invariant variables cannot be estimated, notably on metro which is not that often changed

2 Resuklts

by wave each cross section just have in app and refer briefly, and re; in body only fe

Table 2: FE regressions of SWB.

	a1	a2	a3	a4	a5
metro	0.01	-0.04*	-0.03*	-0.04**	-0.04*
age		0.02***	0.02***	0.01***	0.00
age sq		-0.00**	-0.00	-0.00	-0.00
last year total family income		0.00*	0.00	0.00	0.00
unemployed		-0.18***	-0.18***	-0.16***	-0.16***
male		0.27	0.21	0.07	0.08
health		0.13***	0.13***	0.10***	0.10***
kids			-0.01	-0.01	-0.01
college			-0.08*	-0.07	-0.07
married			0.18***	0.17***	0.17***
family unit size			0.04***	0.03***	0.03***
distress				-0.05***	-0.05***
constant	3.71***	2.37***	2.45***	2.90***	3.60***
state and year dummies	no	no	no	no	yes
N	37567	37489	36285	36142	36142
*** p<0.01, ** p<0.05, * p<0.1					

nice size effect like a third or half of hea

3 Conclusion and discussion

Supplementary Online Material (SOM)

[note: this section will NOT be a part of the final version of the manuscript, but will be available online instead]

3.1 Variables' Definitions

Table 3: Variable definitions.

name	description
swb	"Please think about your life as a whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not very satisfied, or not at all satisfied?" 1 (lo) - 5 (hi)
metro	"Metropolitan/Non-metropolitan Indicator. This indicator is derived from the 2013 Beale-Ross Rural-Urban Continuum Codes published by USDA based on matches to the FIPS state and county codes." 1 Metropolitan area (Beale-Ross Code ER775923= 1-3) 0 Non-metropolitan area (Beale-Ross Code ER775923= 4-9)
age	age
age sq	age squared
last year total family income	last year total family income
unemployed	EMPLOYMENT STATUS-1ST MENTION; We would like to know about what you do – are you working now, looking for work, retired, keeping house, a student, or what?–FIRST MENTION; 1="Looking for work, unemployed", 0 otherwhise
male	gender
health	"Now I have a few questions about your health. Would you say your health in general is excellent, very good, good, fair, or poor?" 1 (poor) to 5 (excellent)
kids	"Number of Persons Now in the FU Under 18 Years of Age"
college	"Did (you/he/she) attend college?" 1='yes', 0='no'
married	"Are you married, widowed, divorced, separated, or have you never been married?" 1='married'; 0 otherwhise
family unit size	Number of Persons in FU at the Time of the Interview
white	"What is (your/his/her) race? (Are you/Is [he/she]) white, black, American Indian, Alaska Native, Asian, Native Hawaiian or other Pacific Islander?–FIRST MENTION" 1='white', 0 otherwhise
distress	The K-6 Non-Specific Psychological Distress Scale

3.2 Summary statistics

```
      id:  2, 3, ..., 14365                          n =      10108
      yr:  2009, 2011, ..., 2019                     T =          6
           Delta(yr) = 1 unit
           Span(yr)  = 11 periods
           (id*yr uniquely identifies each observation)

Distribution of T_i:   min      5%     25%       50%       75%     95%     max
                         1       1       2         4         6       6       6

     Freq.  Percent    Cum. |  Pattern*
 ------------------------+----------
     3179     31.45   31.45 |  111111
      723      7.15   38.60 |  ....11
      672      6.65   45.25 |  .....1
```

```
      548      5.42   50.67 |  ...111
      505      5.00   55.67 |  ..1111
      502      4.97   60.64 |  1.....
      481      4.76   65.39 |  .11111
      480      4.75   70.14 |  111...
      450      4.45   74.59 |  11....
     2568     25.41  100.00 | (other patterns)
 --------------------------+----------
    10108    100.00         |  XXXXXX
 ------------------------------------
 *Each column represents 2 periods.
```

Variable		Mean	Std. Dev.	Min	Max	Observations
swb	overall	3.718723	.8759134	1	5	N = 37767
	between		.7136601	1	5	n = 10091
	within		.5603667	.5187227	6.552056	T-bar = 3.74264
met	overall	.7801749	.4141335	0	1	N = 37730
	between		.385049	0	1	n = 10073
	within		.1878218	-.0531584	1.613508	T-bar = 3.74566
age	overall	44.85923	16.82858	16	99	N = 37928
	between		17.23457	17	99	n = 10107
	within		2.911229	37.19257	51.60923	T-bar = 3.75265
age2	overall	2295.544	1698.311	256	9801	N = 37928
	between		1728.178	289	9801	n = 10107
	within		285.6776	1268.044	3368.044	T-bar = 3.75265
inc	overall	61242.84	81095.25	0	3316000	N = 37912
	between		66126.72	0	1883797	n = 10108
	within		39658.52	-937554.6	2052160	T-bar = 3.75069
une	overall	.0907629	.2872754	0	1	N = 37923
	between		.2197753	0	1	n = 10108
	within		.2116276	-.7425705	.9240962	T-bar = 3.75178
male	overall	.5491432	.4975856	0	1	N = 37930
	between		.4994373	0	1	n = 10108
	within		.0058544	-.2508568	1.049143	T-bar = 3.75247
hea	overall	3.436374	1.046857	1	5	N = 37862
	between		.92175	1	5	n = 10100
	within		.5731675	.4363742	6.603041	T-bar = 3.74871
kid	overall	.6846296	1.119852	0	11	N = 37930
	between		1.061457	0	11	n = 10108
	within		.4720193	-3.148704	5.18463	T-bar = 3.75247
col	overall	.6264205	.4837605	0	1	N = 36608
	between		.4803487	0	1	n = 9674
	within		.0744979	-.2069129	1.459754	T-bar = 3.78416
mar	overall	.2802942	.4491489	0	1	N = 37928
	between		.412416	0	1	n = 10107
	within		.1586708	-.5530391	1.113628	T-bar = 3.75265
nFU	overall	2.281413	1.412387	1	14	N = 37930
	between		1.317328	1	13	n = 10108
	within		.615575	-3.468587	8.081413	T-bar = 3.75247
whi	overall	.5256386	.4993489	0	1	N = 37697
	between		.4985538	0	1	n = 10038
	within		.0213918	-.2743614	1.192305	T-bar = 3.75543
k	overall	3.608904	4.151942	0	24	N = 37689
	between		3.629813	0	24	n = 10083
	within		2.339743	-10.05776	22.6089	T-bar = 3.73788

	swb	met	age	age2	inc	une	male
swb	1.0000						
met	-0.0777*	1.0000					
age	0.0845*	-0.0424*	1.0000				
age2	0.0862*	-0.0494*	0.9821*	1.0000			
inc	0.1292*	0.0637*	0.0918*	0.0497*	1.0000		
une	-0.1247*	0.0175	-0.1885*	-0.1795*	-0.1272*	1.0000	

```
        male |   0.0846* -0.0588* -0.0125  -0.0256   0.2901* -0.0173   1.0000
         hea |   0.2610*  0.0263* -0.2471* -0.2404*  0.2028* -0.0052   0.1445*
         kid |  -0.0030   0.0154  -0.2874* -0.3019*  0.0129   0.0904* -0.0911*
         col |   0.0432*  0.0780* -0.0847* -0.0955*  0.2438* -0.1242*  0.0619*
         mar |   0.2020* -0.0566*  0.1662*  0.1341*  0.4214* -0.1160*  0.5524*
         nFU |   0.0456*  0.0159  -0.1561* -0.1877*  0.1589*  0.0429*  0.0868*
         whi |   0.0889* -0.1813*  0.1524*  0.1609*  0.2491* -0.1519*  0.2460*
           k |  -0.3653* -0.0041  -0.1151* -0.1069* -0.1761*  0.1175* -0.1473*

             |      hea      kid      col      mar      nFU      whi        k
-------------+---------------------------------------------------------------
         hea |   1.0000
         kid |   0.0502*  1.0000
         col |   0.1741* -0.0370*  1.0000
         mar |   0.1270*  0.1009*  0.1451*  1.0000
         nFU |   0.0532*  0.8620* -0.0247   0.3508*  1.0000
         whi |   0.1129* -0.1561*  0.1912*  0.2796* -0.0857*  1.0000
           k |  -0.3066*  0.0306* -0.1049* -0.1843* -0.0308* -0.0836*  1.0000


             |      swb      met      age     age2      inc      une     male
-------------+---------------------------------------------------------------
         swb |   1.0000
         met |  -0.0227   1.0000
         age |   0.0682* -0.0407*  1.0000
        age2 |   0.0686* -0.0417*  0.9850*  1.0000
         inc |   0.1606*  0.0764*  0.0547*  0.0255*  1.0000
         une |  -0.0889*  0.0075  -0.1425* -0.1350* -0.1374*  1.0000
        male |   0.0631* -0.0192  -0.0321* -0.0416*  0.2889* -0.0238   1.0000
         hea |   0.3006*  0.0418* -0.1905* -0.1827*  0.2125* -0.0357*  0.1202*
         kid |   0.0514* -0.0061  -0.2798* -0.2961*  0.0524*  0.0246* -0.0592*
         col |  -0.0061   0.1029* -0.0514* -0.0615*  0.2578* -0.1350*  0.0318*
         mar |   0.2058* -0.0111   0.1519*  0.1295*  0.4476* -0.1123*  0.5064*
         nFU |   0.1109* -0.0045  -0.1631* -0.1911*  0.1962* -0.0045   0.0803*
         whi |   0.0568* -0.1340*  0.1379*  0.1481*  0.2469* -0.1125*  0.1887*
           k |  -0.3799* -0.0095  -0.1768* -0.1697* -0.1489*  0.1104* -0.1115*

             |      hea      kid      col      mar      nFU      whi        k
-------------+---------------------------------------------------------------
         hea |   1.0000
         kid |   0.0530*  1.0000
         col |   0.1242* -0.0456*  1.0000
         mar |   0.1217*  0.1258*  0.1375*  1.0000
         nFU |   0.0545*  0.8620* -0.0265*  0.3553*  1.0000
         whi |   0.0734* -0.0755*  0.1525*  0.2474* -0.0181   1.0000
           k |  -0.2978*  0.0113  -0.0548* -0.1872* -0.0414* -0.0129   1.0000
```

3.3 Panel Structure of Metro Variable

```
xttab met


                   Overall              Between             Within
      met |     Freq.  Percent       Freq.  Percent         Percent
----------+-----------------------------------------------------------
 Inap.:   |     8294     21.98       2947     29.26           77.39
 Metropol |    29436     78.02       8362     83.01           93.19
----------+-----------------------------------------------------------
    Total |    37730    100.00      11309    112.27           89.07
                              (n = 10073)


xtsum met


Variable         |      Mean   Std. Dev.       Min        Max |    Observations
```

```
-----------------+---------------------------------------------+----------------
met      overall |  .7801749   .4141335          0          1 |      N =   37730
         between |              .385049          0          1 |      n =   10073
         within  |             .1878218  -.0531584   1.613508 | T-bar = 3.74566
```

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