Sorting, Attitude and Preference Alignment for Local Public Goods

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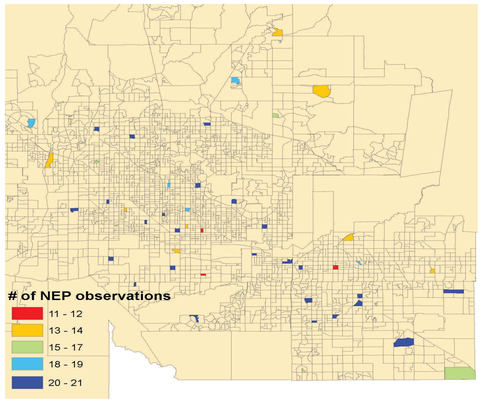

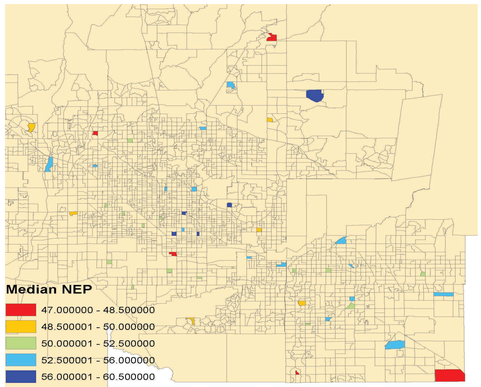

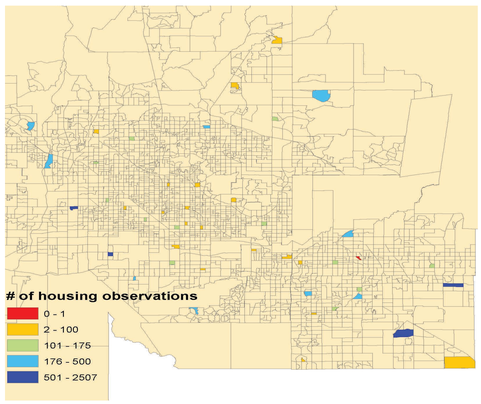

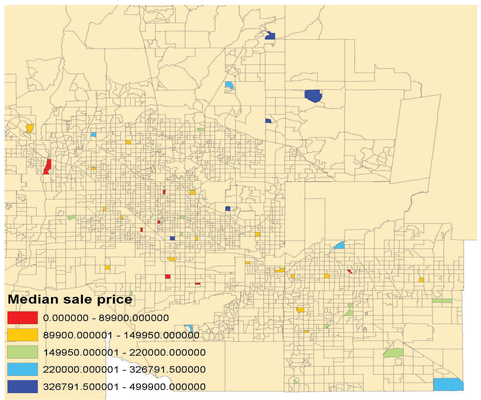

Context

- **Samuelson -** It is impossible for the market to efficiently allocate local public goods.
- **Tiebout -** It is possible for the market to efficiently allocate local public goods given costless sorting in and out of locales is possible.
- **Becker -** Social interaction can be explained as an economic phenomenon.
- **Oates -** At what level of government should public goods be provided? It depends on the characteristics of the public good.
- **Kotchen -** Do people with environmentally friendly attitudes display a higher WTP for environmental amenities? Using contingent valuation studies the answer thus far is yes.

Taken Together

Assuming environmental amenities are local public goods, sorting is possible, and social interaction effects exist, we would expect to see people with similar tastes for local public goods in locales with similar levels of local public goods.

Question

- Are households' attitudes toward ecosystem services consistent with estimates of economic tradeoffs to enhance these services?
- In other words, do we observe demographic and attitudinal differences in local populations that correlate with price indices of local public goods i.e. sorting?

Hypothesis

People with pro-environmental attitudes sort into places with higher levels of local public goods.

New Ecological Paradigm (NEP)

- First developed in 1978 by Dunlap and Van Liere, called the New Environmental Paradigm.
- Updated in 2000 and changed its name to the New Ecological Paradigm.
- 15 statement Likert scale that measures pro-environmental attitudes.
- 15 statement is considered the "full" NEP, but many studies have used less than 15 statements, normally between 5 and 7.
- This will serve as a measure of attitudinal differences.

Table 1. Frequency Distributions and Corrected Item-Total Correlations for New Ecological Paradigm Scale Items[a]

Do you agree or disagree[b] that:	SA[c]	MA	U	MD	SD	(*N*)	r_{i-t}
1. We are approaching the limit of the number of people the earth can support	27.7%	25.2%	21.0%	16.0%	10.0%	(667)	.43
2. Humans have the right to modify the natural environment to suit their needs	4.1	28.5	9.2	33.9	24.3	(663)	.35
3. When humans interfere with nature it often produces disastrous consequences	44.6	37.6	4.0	11.2	2.5	(668)	.42
4. Human ingenuity will insure that we do NOT make the earth unlivable	7.8	23.5	21.5	24.4	22.7	(664)	.38
5. Humans are severely abusing the environment	51.3	35.3	2.6	9.3	1.5	(665)	.53
6. The earth has plenty of natural resources if we just learn how to develop them	24.4	34.8	11.3	17.5	11.9	(663)	.34
7. Plants and animals have as much right as humans to exist	44.7	32.2	4.7	12.8	5.7	(665)	.46
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	1.1	7.4	11.3	30.9	49.4	(664)	.53
9. Despite our special abilities humans are still subject to the laws of nature	59.6	31.3	5.4	2.9	0.8	(664)	.33
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated	3.9	17.9	13.8	25.9	38.5	(665)	.62
11. The earth is like a spaceship with very limited room and resources	38.0	36.3	7.5	13.4	4.8	(664)	.51
12. Humans were meant to rule over the rest of nature	13.5	20.4	8.2	23.9	34.0	(661)	.51
13. The balance of nature is very delicate and easily upset	45.9	32.8	5.9	14.1	1.4	(665)	.48
14. Humans will eventually learn enough about how nature works to be able to control it	3.2	20.1	24.2	27.9	24.6	(666)	.35
15. If things continue on their present course, we will soon experience a major ecological catastrophe	34.3	31.0	16.9	14.1	3.6	(667)	.62

[a]Question wording: "Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you STRONGLY AGREE, MILDLY AGREE, are UNSURE, MILDLY DISAGREE or STRONGLY DISAGREE with it."
[b]Agreement with the eight odd-numbered items and disagreement with the seven even-numbered items indicate pro-NEP responses.
[c]SA = Strongly Agree, MA = Mildly Agree, U = Unsure, MD = Mildly Disagree, and SD = Strongly Disagree.

Data Development

Inputs:
1) Phoenix Area Social Survey (2011)
- Full NEP and demographic variables for the 45 PASS neighborhoods
- Several subsets of "Full" NEP created to match subsets used by Kotchen, and the subset from the 2006 PASS

2) Phoenix Area Social Survey (2006)
- Subset of NEP (only 4 statements) matched to respondents from 2011 PASS

3) Spatially located housing data from Dataquick
- Only houses in a PASS neighborhoods were kept

4) Local public goods variables
- Temperature and a wet/dry dummy based on satellite images of landscape from Klaiber, Smith 2011, AERE
  >> Other variables were available but due to the small sample size (45 neighborhoods) many were omitted
- School test averages from 2003-2007 (Arizona Department of Education)
- PM10 and air quality index measures of closest monitor to a PASS neighborhood(EPA)

Merging:
All housing data observations were matched to specific PASS observations by parcel number.
All public goods variables were matched spatially using ARCGIS, with the exception of school test scores, which were matched by district name.

Result:
Two datasets are created. One contains all housing sales from 1998 to 2006 that are within a PASS neighborhood. In addition, if any one of the PASS houses sold within 1998 to 2006, that sale was matched with the PASS respondent living in that parcel. The other dataset contains the exact same variables, except that it contains every housing sale in a PASS neighborhood from 1998 to 2011.

Stage 1 - Get neighborhood price indices

- $\ln(price) = \beta_1 sqft + \beta_2 lot\ acres + \beta_3 stories + \beta_4 bathrooms + \beta_5 age + \beta_6 has\ garage + \beta_7 has\ pool + \beta_8 rooms + \beta_9 sqft^2 + \beta_{10} acre^2 + \beta_{11} age^2 + YearFE + NbhdFE$
- This takes advantage of the matching between the PASS and housing data to get price indices for each neighborhood, and controls for temporal market changes in housing prices

```
. /* Regular NEP*/
> reg nbhd_q NEP_adj educ_adj race_adj dum_wet_adj income_adj sdincome_adj sdincome_adj allsubj_adj mtemp_adj daily_m
> conc_adj  con_adj, noconstant;

      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F( 10,    30) =  376.01
       Model |  117383.804    10  11738.3804            Prob > F      =  0.0000
    Residual |  936.55217     30  31.2184057            R-squared     =  0.9921
-------------+------------------------------           Adj R-squared =  0.9894
       Total |  118319.636    40  2957.99091            Root MSE      =  5.5873

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      nbhd_q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     NEP_adj |   .0140416   .0066824     2.10   0.044     .0003943    .027689
    educ_adj |   .4376718   .1388254     3.15   0.004     .1541526    .721191
    race_adj |   .0226279   .0912687     0.25   0.806    -.1637513    .2090072
dum_wet_adj |  -.0242476   .2007026    -0.12   0.905    -.4343003    .3858052
  income_adj |   4.42e-06   1.07e-06     4.12   0.000     2.23e-06    6.61e-06
sdincome_adj |  -2.96e-06   1.77e-06    -1.67   0.105    -6.58e-06    6.35e-07
allsubj_adj |   .0010691   .0010113     1.06   0.299    -.0009963    .0031345
  mtemp_adj |   .017576    .0192732     0.91   0.369    -.0217052    .0568372
daily_mconc_adj |  -.0002187   .0017026    -0.13   0.899    -.0036958    .0032584
    con_adj |   5.821905   1.701542     3.42   0.002     2.346893    9.296917
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```

```
.  /*Kotchen's NEP*/
> reg nbhd_q NEP_kotchen04_adj educ_adj race_adj dum_wet_adj income_adj sdincome_adj allsubj_adj mtemp_a
> dj daily_mconc_adj  con_adj, noconstant;

      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F( 10,    30) =  327.53
       Model |  117245.717    10  11724.5717            Prob > F      =  0.0000
    Residual |  1073.91955    30  35.7973183            R-squared     =  0.9909
-------------+------------------------------           Adj R-squared =  0.9879
       Total |  118319.636    40  2957.99091            Root MSE      =  5.9831

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      nbhd_q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
NEP_kotchen04_adj |   .0015231   .013236     0.12   0.909    -.0255885    .0285547
    educ_adj |   .3784686   .1538313     2.46   0.020     .0643832    .692634
    race_adj |   .0717162   .0950965     0.75   0.457    -.1224968    .2659292
dum_wet_adj |   .0727142   .2892855     0.25   0.731    -.5547039    .7001323
  income_adj |   4.65e-06   1.16e-06     4.01   0.000     2.28e-06    7.03e-06
sdincome_adj |  -3.16e-06   1.91e-06    -1.66   0.108    -7.06e-06    7.39e-07
allsubj_adj |   .0011544   .0010838     1.07   0.295    -.0010591    .0033678
  mtemp_adj |   .0112837   .0209924     0.54   0.595    -.0315886    .054156
daily_mconc_adj |  -.0002942   .0018793    -0.15   0.881    -.0041221    .0035538
    con_adj |   7.027829   1.755482     4.00   0.000     3.442657    10.613
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Stage 2 - Attempt to explain observed price indices

- Adjust all variables for estimation error to control for nonspherical errors by using a cholesky decomposition on the variance covariance matrix from stage 1
- $NBDHFe = \gamma_1 NEP + \gamma_2 mean\ test\ scores + \gamma_3 education + \gamma_4 race + \gamma_5 house\ wet + \gamma_5 income + \gamma_6 s.d.Income + \gamma_7 mean\ temp. + \gamma_8 mean\ conc.\ PM10 + constant$

```
. /*2011 subset to match 2006 NEP */
> reg nbhd_q NEP1106_adj educ_adj race_adj dum_wet_adj income_adj sdincome_adj allsubj_adj mtemp_adj dai
> ly_mconc_adj  con_adj, noconstant;

      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F( 10,    25) =  305.38
       Model |  140628.223    10  14062.8223            Prob > F      =  0.0000
    Residual |  1151.24867    25  46.0499467            R-squared     =  0.9919
-------------+------------------------------           Adj R-squared =  0.9886
       Total |  141779.463    35  4050.84181            Root MSE      =  6.786

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      nbhd_q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  NEP1106_adj |   .0137357   .022284     0.62   0.543    -.0321159    .0596304
    educ_adj |   .2753059   .1374673     2.00   0.056    -.0078133    .5584252
    race_adj |   .0761612   .0971725     0.78   0.441    -.1239693    .2762918
dum_wet_adj |   .1066749   .2149272     0.50   0.624    -.3359759    .5493257
  income_adj |   4.29e-06   1.05e-06     4.06   0.000     2.11e-06    6.46e-06
sdincome_adj |  -2.67e-06   1.77e-06    -1.51   0.144    -6.31e-06    9.77e-07
allsubj_adj |   .0014287   .0010709     1.33   0.197    -.0007848    .0036262
  mtemp_adj |   .0342893   .0213424     1.61   0.121    -.0096661    .0782447
daily_mconc_adj |   .0002497   .0016409     0.15   0.881    -.0031307    .0036282
    con_adj |   4.899662   1.834529     2.67   0.013     1.121378    8.677945
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```

```
.  /* 2006 NEP */
> reg nbhd_q y06NEP_adj educ_adj race_adj dum_wet_adj income_adj sdincome_adj allsubj_adj mtemp_adj dail
> y_mconc_adj  con_adj, noconstant;

      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F( 10,    25) =  311.18
       Model |  140649.586    10  14064.9586            Prob > F      =  0.0000
    Residual |  1129.8773     25  45.1950292            R-squared     =  0.9920
-------------+------------------------------           Adj R-squared =  0.9888
       Total |  141779.463    35  4050.84181            Root MSE      =  6.723

------------------------------------------------------------------------------
      nbhd_q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  y06NEP_adj |   .0119787   .0129322     0.93   0.363    -.0146555    .038613
    educ_adj |   .3132198   .1454981     2.15   0.041     .0132772    .6128623
    race_adj |   .0613407   .0980632     0.63   0.537    -.1406244    .2633057
dum_wet_adj |   .009869    .2124711     0.05   0.963    -.4277234    .4474615
  income_adj |   4.22e-06   1.05e-06     4.03   0.000     2.06e-06    6.37e-06
sdincome_adj |  -2.45e-06   1.77e-06    -1.39   0.178    -6.10e-06    1.19e-06
allsubj_adj |   .0010535   .0011566     0.91   0.371    -.0013205    .0034355
  mtemp_adj |   .032733    .0210814     1.55   0.133    -.0106048    .0761509
daily_mconc_adj |  -.0000932   .0016097    -0.06   0.956    -.0035732    .0033868
    con_adj |   5.095707   1.758081     2.90   0.008     1.473389    8.718024
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Conclusion

Using a full or partial NEP matters. This could only be true for small samples (n=40) but merits further investigation.

There is a significant positive correlation between NEP and neighborhood quality.

This result does not seem to persist over time with this sample. However that could be due to the fact that only a subset of the NEP was asked in 2006, and that the sample has not been consistent, nor random, over this time period-- 5 new neighborhoods were added in 2011, and the neighborhoods are not selected randomly.

There is a significant positive correlation between mean income and neighborhood quality.

This result does persist over time and changes in the sample, which lends further support to the concept of social interactions.

Attitudes are important, and a means of predicting economic behavior. Much more research clearly needs to be done, but these results serve as a proof of concept.

References

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