Median Voter Model

Basic theory from Enelow & Hinich, *The Spatial Theory of Voting: An Introduction*, 1984, Chpt 2 "The Unidimensional Spatial Voting Model"

Role of Elections -

Direct - voters approve/reject taxes, spending, laws; usually at local level (e.g., budget referendum for new school, constitutional amendments in FL)

Agent - voters elect officials to represent them; elected officials are agents of voters (principals)

Voter's Preference

Utility - $U(G,C)$ (keeping it simple so everything is scalar)

where $G =$ amount of government service provided

$C =$ amount of private good consumed

Budget - $M_i = C + p_i G$

where $M_i =$ income of voter i

$p_i =$ voter i's price for each unit of G (specific to each voter)

Private good is numeraire so price per unit of C is 1

Tax - voter's expenditure on government services is $p_i G$ ... need to look at government budget constraint to determine tax

Proportional Tax - major simplifying assumption that is reasonable for local level (or states without an income tax) because property and sales taxes have been empirically shown to be close to proportional tax (i.e., tax paid is fixed percentage of income); Note: an income tax is easier to have a progressive tax (i.e., tax paid as percentage of income increases with income)

Tax Rate - since everyone pays fixed percentage, we'll call it t

Note: $tM_i = p_i G$

Government Budget

Households - N total households to tax

Total Revenue - $\sum_{i=1}^{N} tM_i = t\sum_{i=1}^{N} M_i$

Total Cost - need more information on nature of public good... use education example

Education Example - suppose each household has K kids;

each kid gets G units of government services;

$P_G =$ cost of providing each kid with 1 unit of G

Total Spending - $P_G GKN$ (Note: assuming constant returns to scale)

Budget Balance - total revenue = total spending: $t\sum_{i=1}^{N} M_i = P_G GKN$

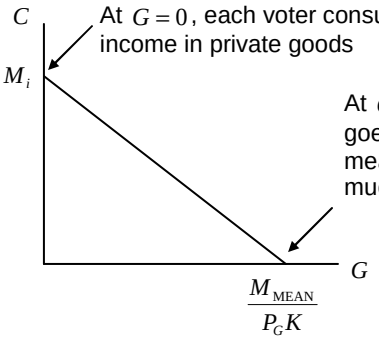
Solve for t: $t = \frac{P_G GKN}{\sum_{i=1}^{N} M_i} = \frac{P_G GK}{\frac{1}{N}\sum_{i=1}^{N} M_i} = \frac{P_G GK}{M_{\text{MEAN}}}$

Revisit Voter's Preference - sub tax rate into voter's budget constraint:

$$M_i = C + p_i G = C + tM_i$$

$$= C + \left[\frac{P_G GK}{M_{\text{MEAN}}}\right] M_i = C + \left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right] G$$

Solve for C: $C = M_i - \left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right] G$ (slope intercept form of budget constraint)



At $G = 0$, each voter consumes his income in private goods

At $C = 0$, all community income goes to government service; note mean income determines how much G can be provided

$$0 = M_i - \left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right] G$$

$$\left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right] G = M_i$$

$$G = \frac{M_i}{P_G K \frac{M_i}{M_{\text{MEAN}}}} = \frac{M_{\text{MEAN}}}{P_G K}$$

Slope - $-\left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right] =$ how much C household must give up (keeping income constant) to have one more unit of G ... Cost of G to voter

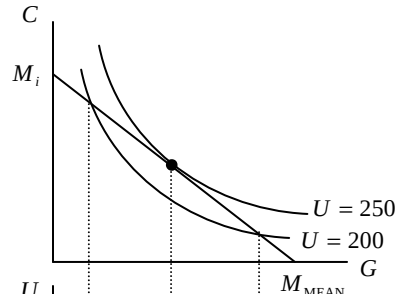
Factors:

$P_G \uparrow \Rightarrow$ cost of $G \uparrow$ (steeper budget curve); G costs more because it's more expensive

$K \uparrow \Rightarrow$ cost of $G \uparrow$ (steeper budget curve); G costs more because there are more kids

$M_i / M_{\text{MEAN}} \uparrow \Rightarrow$ cost of G to voter $i \uparrow$ (steeper budget curve); previous examples had budget curve getting steeper because max G was getting lower; this scenario makes it steeper because $M_{\text{MEAN}} \downarrow$ (smaller max G) or $M_i \uparrow$ (same G, but intercept is higher)

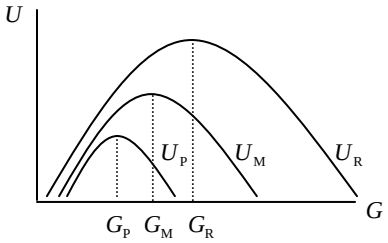
Max Utility - voter is best off where indifference curve is tangent to budget constraint

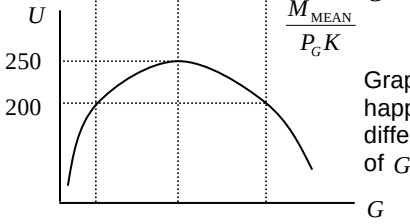


Median Voter Model

<u>Assume</u> community has three households (rich, middle, poor)

<u>Assume</u> richer voter demands more G (only need monotonicity so it could go the other way)





Graph shows happiness at different levels of G

G_P vs. G_M - for both rich and middle, $U(G_M) > U(G_P)$ so G_M wins (beats *any* $G < G_M$)

G_M vs. G_R - for both poor and middle, $U(G_M) > U(G_R)$ so G_M wins (beats *any* $G > G_M$)

Generalized -

Median Voter - determined by number who prefer higher G equal to number who prefer lower G, so G preferred by median voter will beat any other G

Theorem - if demand for G is monotonic wrt income and all people vote, the median voter is the one with median income

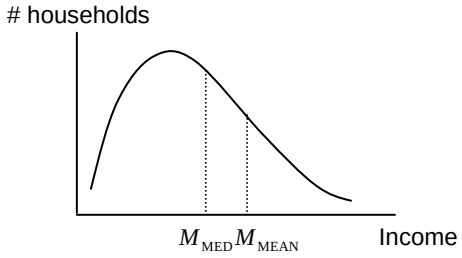
For more details see ECO 7938-7097 (Public Markets) notes on "Majority Choice"

Skewed Distribution - income is skewed toward lower income so $M_{\text{MED}} < M_{\text{MEAN}}$

Privately Provided - if service were provided privately, the cost of service to a household would be $P_G K$

Publicly Provided - cost of publicly provided goods to median voter is $P_G K M_{\text{MED}} / M_{\text{MEAN}}$

Difference - if we <u>assume</u> private and public sectors are equally efficient in provision of education (e.g., same quality; "source of contention"), then median voter reduces his cost by getting it publicly provided because $M_{\text{MED}} / M_{\text{MEAN}} < 1$



Redistribution - median voter is taking advantage of income redistribution through tax system; results form linear tax (proportional to income) and skewed income distribution

Competition Among Candidates

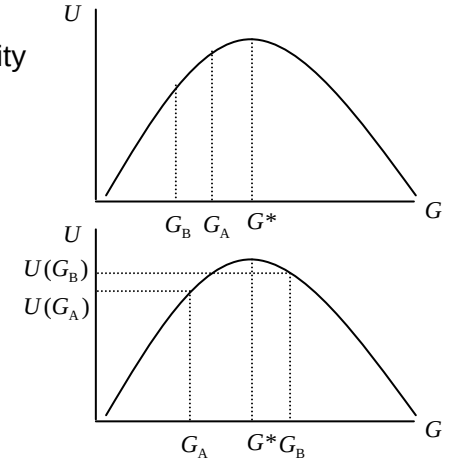
Voting - household votes for candidate whose policy gives higher utility

Example - 2 candidates competing over G (single policy)

Same Side - if both candidates' proposed G are on same side of voter's ideal point (G^*), the voter picks the candidate whose G is closer to G^* (picks A in the picture)

Opposite Sides - if candidates' proposed G are on opposite sides of voter's idea point, voter compares $U(G_{\text{A}})$ & $U(G_{\text{B}})$

Symmetric - if $U(G)$ is symmetric, voter uses same criteria as when proposals are on same side (i.e., pick G closest to G^*)



Result - strong tendency to vote for closer candidate; forces pushing candidates toward median voter's position G_{MED}; any platform not at the median voter position can be beaten by the median voter position ∴ median voter model suggests candidates will be indistinguishable (both pick median voter position)

<u>Income Effect</u> - suppose M_i and M_{MEAN} rise by 10%; slope of voter's budget constraint doesn't change, but budget line moves up (or right) so voter consumes more of both C and G (i.e., we expect G is a normal good

Evidence - Inman in *Current Issues in Urban Economics*, 1979 - computed income elasticity of different types of public goods:

Public Good	**Income Elasticity**
Education	0.34-0.68
Parks & Recreation	1.00
Police & Fire	0.60
Public Works	0.40-0.80
Total	0.60-0.75

Kenny & Husted in *JPE*, Feb 1997 - found income elasticity of non-welfare public goods to be 0.25-0.38

Result - average income elasticity for all goods in consumer's budget (by definition) is 1.0; public goods are normal, but elasticity is less than 1 $\therefore$ income $\uparrow \Rightarrow G \uparrow$ by smaller %; this means richer communities can have lower tax rates (more tax revenue collected and more is spent, but it's a smaller percentage of voter's incomes)

Serrano - court case in California mandating equal spending; we'll study this later in a Husted & Kenny paper

Effect of Private School -

No Private - assume all households vote (or voting is not clustered so same % of each income level votes) and there are no kids in private school; the median voter is the median income household

Add Private - now assume all households vote, but the kids in the highest income household goes to private school; effectively, this puts the highest income household below the lowest income for demand of G; the new median voter has a lower income (then median income); this is sometimes called "the ends against the middle"

Example -

Income	**All kids in Public**	**80K kid in Public**
20K		
30K		Median
45K	Median	
55K		
80K		(effectively demands $G = 0$)

Evidence - Romer & Rosenthal, *Economic Inquiry*, Oct 1982 - ran model to estimate school spending as function of community's decile income; best fit based on R^2 is 40th percentile (although it's really not that different from median)

Income Decile	**R-square**
1	0.555
2	0.598
3	0.608
4	0.61053 $\leftarrow$ best fit
5	0.61050
6	0.609
7	0.599
8	0.580
9	0.542

Substitution Effect - recall relative price of government service for median voter is $P_G KM_{\text{MED}} / M_{\text{MEAN}}$ (because private good is numeraire); as $P_G \uparrow$, median voter will substitute away from public good

Evidence - Inman article from previous page? (Kenny didn't say, but it looks the same)

Public Good	**Price Elasticity**
Education	0.07-0.48
Parks & Recreation	0.23-0.50
Police & Fire	0.20-0.70
Public Works	0.50-1.00
Total	0.23-0.68

Lovell, "Spending for Education: The Exercise of Public Choice," *Review of Economics and Statistics*, Nov 1978 - first to test effect of M_{MED} / M_{MEAN} on demand; looked at education spending in Connecticut; found spending fell as M_{MED} / M_{MEAN} rose (i.e., communities with more opportunity for income redistribution [bigger difference between M_{MED} and M_{MEAN}] have higher government spending)

Gemmell, Morrissey & Pinar, "Fiscal Illusion and Political Accountability: Theory and Evidence from Two Local Tax Regimes in Britain," *Public Choice*, Mar 2002 - England replaced proportional tax with a head tax from 1990-1993

Head Tax - each adult paid $\$H$ to finance local government; head tax is usually preferred by welfare economists because there's no distortion in consumption

Theory - Assuming taxes = government spending:

$HN = P_G GKN$ (head tax * # families = tax; spending from bottom of p.1)

Cancel N: $H = P_G GK$

That means cost of increasing G by 1 unit is $P_G K$ (same as private provision)

Gemmell found M_{MED} / M_{MEAN} had no effect on spending under a head tax; it had a negative effect on spending under property tax (i.e., bigger difference between M_{MED} and M_{MEAN} means higher government spending... same as Lovell's conclusion)

May not get this out of Gemmell's paper because "They spent a lot of time talking about other garbage."

Other Sources of Tax - non-residential property (industrial parks, officers, retail, etc.) adds to property tax base so it subsidizes the median voter; Lovell also found $G \uparrow$ as % of non-residential property $\uparrow$

Discussion Article

Timmins, "Does the Median Voter Consume Too Much Water? Analyzing the Redistributive Role of Residential Water Bills," *National Tax Journal*, Dec 2002.

"Cities with more skewed income distributions tend to engage in more redistributive activities than other conditionally similar communities" (687)

Background - overuse of water because price charged is less than economic value

Farmers - "costs of these subsidies are typically spread over large (i.e., statewide or national) constituencies that lack the political cohesiveness to correct the inefficiency" (687)

Municipal Users - also subsidized in "the West" (but only talks about California); "these subsidies are funded by municipal taxpayers though either property taxes, sales taxes, user fees, a broad array of other taxes, or reductions in other municipal services" (687)... assumes these are by voter choice (i.e., voters pay attention at the local level)

Regressive Tax - numerous empirical studies (listed in footnote 2, p.689) show burden of revenues from household water use "falls disproportionately on the city's poorer residents"... "Municipalities wishing to redistribute income amongst their residents but with a limited set of fiscal tools at their disposal might therefore do so by substituting relatively progressive alternative revenue sources for those water charges"

Own Support - Table 1 (p.691); uses 9 income groups; looks at effective tax rate of several municipal charges; ratio of this rate for lower income to higher income is greater than 1 (suggesting burden is greater for poorer households)

TABLE 1
RELATIVE INCIDENCE OF RESIDENTIAL WATER CHARGES, PROPERTY AND SALES TAXES

$$\text{Effective Tax Rate} = 100 \times \frac{\text{Annual Expenditure}}{\text{Household Income}}$$

Income Group	Income Range	Water Charge	Property Charge	Sales Tax	Electricity Tax	Gas Charge
1	< 5,000	31.9	44.2	30.5	83.4	66.9
2	5,000 – 10,000	2.1	5.4	7.7	6.9	4.0
3	10,000 – 20,000	1.4	2.7	5.5	3.8	2.2
4	20,000 – 30,000	0.9	1.8	4.6	2.4	1.4
5	30,000 – 40,000	0.8	1.8	3.5	2.0	1.1
6	40,000 – 55,000	0.6	1.9	3.4	1.6	0.9
7	55,000 – 70,000	0.5	1.8	2.7	1.3	0.7
8	70,000 – 100,000	0.4	2.0	2.5	1.1	0.6
9	> 100,000	0.3	2.2	2.5	0.8	0.5
Ratio: Group 1 to Group 9		106.3	20.1	12.2	104.3	133.8
Ratio: Average of Groups 1, 2, and 3 to the Average of Groups 8 and 9		33.7	8.3	5.8	33.0	44.3
Ratio: Average of Groups 2, 3, and 4 to Groups 7 and 8		2.9	1.1	2.0	2.8	3.0

Source: Property and sales tax incidence are calculated from data reported in Sheffrin and Dresch, 1995, while the incidence of charges for water, electricity, and gas are derived from a 0.1 percent random sample of California data maintained in the 1990 Census Public Use Microdata Files.

Junk Data - < 5,000 category has "potential problem"; includes people who are very wealthy, but have low income or negative (from business loss); only ratios in third row are really valid

Problem? - if city is using electricity and gas charges to subsidize water, this shoots down the redistribution argument because these are just as regressive (author mentions this on p.692)

Model - modify Meltzer & Richard (1981) median voter model;

Actors - "heterogeneous water consuming households and a majority-elected municipal manager whose only role is to balance the municipal budget"

Revenues - come from (i) water bills, (ii) income taxes (proxy for property taxes, sales taxes, user fees, etc.)

Outline - model presented on pp. 693-694; using continuum of households that consume only water and composite of all other goods (numeraire); have quasilinear utility

[9] $P_i^* = \frac{cI_i}{E[I]}$

"Household i therefore prefers to mark up or down the price of water [P_i^*] to a percentage of marginal cost [c] determined by its share of the mean income in the municipality [$I_i / E[I]$]" (694)

"In a typical right skewed income distribution, the (pivotal) median voter will choose a price for water below marginal cost." (694)

Data - 95 California municipalities in 199 (intersection of 4 data sources):

(1 & 2) 1990 Census & *City and County Data Book* (1994) give municipal characteristics:

- Household income distribution (nine bins)
- Measure of housing stock (% condos, % 0 or 1 bedroom, % 4+ bedrooms, % build before 1939, % build after 1980
- Population density

(3 & 4) California State Controller Municipal Income and Expense Statements and California Department of Water Resources' Bulletin 166-4, "Urban Water Use in California" give economic decision data (water pricing decisions by municipal mangers and water-use decisions by aggregate municipal residents):

- Multi-part rate structures (fixed service fees, "free" water allocations, service charges, total revenues form water sales)
- Expenditures on factor inputs (water acquisition, treatment, pressurization, distribution, administration)
- Source of water input (ground vs. surface)
- Aggregate municipal water consumption

Assumes marginal costs equal average variable costs

Markups - uses (P – MC)/P... value is negative in 80% of observations and has mean of –0.25 (i.e., on average cities charge price that's 25% below MC)

Problem - given large fixed costs, there are probably economies of scale so MC < AVC

Model -

[13] $\sigma_j^2 = 2 * \left(\ln\left[Mean(I)_j\right] - \ln\left[Median(I)_j\right]\right)$

"The ratio of the price to the cost per unit of water should be inversely proportional to an increasing function of σ^2" (697)

Prediction - $\sigma^2 \uparrow \Rightarrow$ Price$\downarrow$

Results - Table 4 (on next page)

Extra Variables - includes cost measures and income distribution measures; there are no hypotheses given or results discuss, but the don't matter... using markup so costs don't matter (embedded in dependent variable) and income distribution is already captured in σ^2

Municipally Owned - 68 of the 95 cities; show negative relationship

Privately Owned - didn't regress on it's own because not enough data (only 27 cities); effect on price (from column 4):

$$\frac{\partial P}{\partial \sigma^2} = \text{-0.407 - 0.672*(Muni)} = \begin{cases} \text{-0.4 if private (not significant)} \\ \text{-1.07 if municipally owned} \end{cases}$$

Other Things to Consider -

Test Divergent Platform - dummy variable for political party in control of municipal government

Property Taxes -

# of new residents; bypasses Prop 13 because new residents have higher property taxes ∴ more ability to redistribute (JC)

Fraction of property that's non-residential (Lovell article)

Sales Tax - per capita retail sales to capture tourism or commuters from out of town (JC)

TABLE 4
PRICE DISCOUNTING AND MUNICIPAL INCOME DISPERSION
DEPENDENT VARIABLE = $LN(P_i) - LN(c_i)$
HETEROSCEDASTIC-CONSISTENT STANDARD ERRORS

	Municipally Owned Utilities (N = 68)			Full Sample (N = 95)		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−0.020 (0.224)	1.956 (1.397)	2.007 (1.654)	−0.079 (0.161)	2.174 (0.974)	1.945 (1.029)
σ^2	−1.251 (0.674)	−1.527 (0.855)	−1.807 (0.919)	−0.400 (0.703)	−0.688 (0.882)	−0.714 (0.910)
σ^2 * Municipal Ownership				−0.672 (0.434)	−0.883 (0.440)	−0.773 (0.434)
ln Service Connections		−0.090 (0.103)	−0.067 (0.116)		−0.094 (0.083)	−0.071 (0.087)
ln Population Density		−0.054 (0.392)	−0.255 (0.412)		−0.263 (0.215)	−0.357 (0.203)
ln % Houses: Built 1980–90		0.036 (0.145)	0.021 (0.167)		−0.010 (0.096)	0.029 (0.109)
ln % Houses: Built Pre–1939		0.048 (0.055)	0.074 (0.058)		−0.026 (0.058)	−0.000 (0.057)
ln % Houses: Condominiums		0.049 (0.118)	0.039 (0.133)		0.016 (0.094)	−0.013 (0.100)
ln % Houses: 0–1 Bedrooms		0.617 (0.331)	0.491 (0.401)		0.730 (0.244)	0.552 (0.260)
ln % Houses: 4 < Bedrooms		0.199 (0.158)	0.121 (0.180)		0.164 (0.122)	0.088 (0.136)
ln % Raw Water: Surface Water		0.092 (0.148)	0.010 (0.175)		0.064 (0.126)	−0.021 (0.132)
Hydrologic Region Indicators	NO	NO	YES	NO	NO	YES
R^2	0.067	0.186	0.234	0.073	0.219	0.273

Cost Measures

Income Distribution Measures

Not Significant

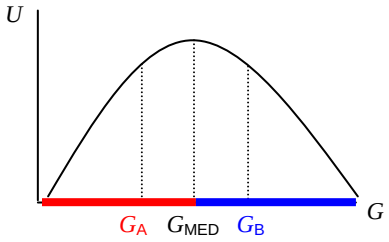
[15] In the results reported in the paper, household income for the highest income category, which is reported as > $75,000, is assumed to be $100,000. Similar empirical results are generated when this value is assumed to be $80,000 or $125,000.

Divergent Platform Model

Downs, "Economic Theory of Democracy" (dissertation) - "Citizens see little point in voting if all choices are identical, so differences between platforms must be created to entice voters to the polls" (i.e., no turnout if voting cannot alter policy)

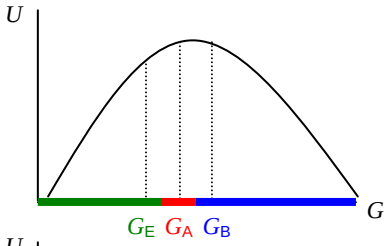
Divergent Platform - parties have platforms balanced around the median voter position
Rationales - several explanations

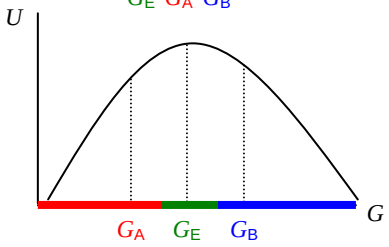
- **Votes & Money** - attract votes or campaign contributions (usually more from extreme tails who have more to gain/lose if the candidate wins/loses
- **Prevent Entry** - of third party; covered below
- **Primaries** - view distribution of voters as split between two parties (A & B); each party has a median voter which decides the candidate; therefore, the candidates who win the primaries will have platforms that diverge from the median voter in the overall population
  - **Non-Myopic** - could have tradeoff where voters look to general election so median voter in the party does not determine the candidate; instead the candidate is closer (but not necessarily at) the position of the median voter in the overall population

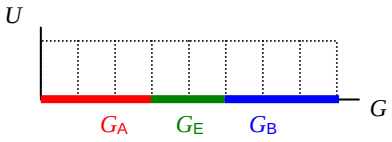


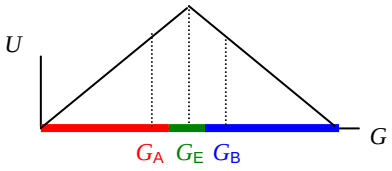
Palfrey, "Spatial Equilibrium with Entry," *Review of Economic Studies*, 1984 - covers basic theory for prevention of third party entry; assume established parties A & B
"Palfrey's model is somewhat ugly."

- **Too Close** - if parties are too close to the median voter, entrant E maximizes votes by locating close to, but to the outside of one of the established parties; this gives that party an incentive to move away from its rival (in the graph A wants to move left)
- **Apart** - if parties get far enough apart, entrant maximizes votes with platform between parties
- **Too Far** - if established party platforms are too far apart, they can increase their votes by moving toward the enter; the ideal location will be close enough to the center to keep the entrant form positioning on the outside of the distribution (so the incumbent parties remain the incumbent parties)
- **Uniform Example** - suppose distribution of preferred points is uniform (0,1); (similar to delivered pricing model from ECO 7938-4299 (Product Differentiation) "Horizontal and Location Models")
  - **Optimal Positions** - 0.25 and 0.75
  - **Votes** - if entrant is at 0.5 - A & B get 3/8; E gets 1/4
- **Pyramidal Example** -
  Optimal Positions - 0.36 and 0.64









Result - positions are closer to median as preferences are more homogeneous
Evidence -

- Goff & Grier, *Public Choice*, Jun 1993 - looked at difference between state senator's ADA scores as function of standard deviation of ADA scores of congressmen

ADA - Americans for Democratic Action, a liberal group that grades politicians based on how they vote compared to the way ADA wants (i.e., liberal); ADA score of 1 means the politician voted the way ADA wanted 100% of the time (e.g., Ted Kennedy is usually around 0.98; conservative Republicans are usually around 0.20)

$|\Delta ADA|$ = absolute different between ADA scores for state's two senators

σ_{ADA} = standard deviation of ADA scores of all of state's congressmen; this measure picks up the heterogeneity of voters in the state (one congressman from each district; districts have different preferences)

Result - $\sigma_{ADA} \uparrow \Rightarrow |\Delta ADA| \uparrow$ (more heterogeneous districts results in bigger spread between senators)

Other Measures - other things that cause $|\Delta ADA| \uparrow$

Population$\uparrow$ (except for NY and Alaska... more heterogeneity from larger population)

Heterogeneity of labor force $\uparrow$

Skewness of income $\uparrow$

Standard deviation of income... not significant (probably can't distinguish between this and skewness of income)

Schmidt, Kenny & Morton, "Evidence on Electoral Accountability in the US Senate: Are Unfaithful Agents Really Punished?" *Economic Inquiry*, Jul 1996 - looked at how senators who strayed from party platforms did in elections

41 states where senators from both parties ran for reelection from 1962 to 1990 (over 400 elections)

Ran 41 different regressions to predict ADA scores for party position in each state (included party, US income, US unemployment, composition of senate, composition of state legislature)

Then looked at absolute difference between senator's ADA and state party position (averaged over the six years the senator was in office)

Result - as difference between senator and party increases, senator is less likely to seek reelection and less likely to win if he does (for 9% difference, chance of running falls by 4%, chance of winning falls by 36%)

Education - drop off in chance of winning is greater in states with better education

Divergent vs. Median - found better fit using state party position described above (i.e., divergent platform model) than using state median voter

Median Voter vs. Divergent Platform

Predictions - both models make strong predictions

Median Voter - support for candidates should be random (because they take the same position)

Divergent Platform - voters on each side of issue support each candidate so there should be voting constituencies

Evidence -

Jung, Kenny & Lott - *Journal of Public Economics*, 1994 - looked at votes cast for each states' two senators (i.e., candidates who won elections) and compared to county data to identify constituencies

Model - for each senator, take % who voted for him in each county in the state; regress that on various country factors: income, % black, % women, % elderly, etc.

Prediction - median voter model predicts nothing in the regression will be significant; further, winners are totally random so predicts probabilities for the three possible combinations of senators:
(D,R) with probability 1/2 and (D,D) or (R, R), each with probability 1/4

Example - currently FL has Martinez (elected in 2004) and Nelson (elected in 2002); take % who voted for Nelson in 2002 and % who voted for Martinez in 2004; treat each of these as dependent variables in regressions with 67 counties of data

Result - ran 42 states; 34 states (81%) had significant regression (usually income and race); suggests median voter model is not valid empirically

Francis & Kenny, *Up the Political Ladder* (book published in 2000) - compiled ADA scores for all senators between 1979 and 1997; looked at mean for each party in each state; found party overlap in scores which suggests median voter does impact party positions (e.g., must be a liberal Republican to win in Maryland and a conservative Democrat to win in Texas)

Examples -

Liberal Republicans - OR (55), RI (57), VT (62), MD (71), CT (79)

Conservative Democrats - MS (33), AL (37), LA (44), OK (45), TX (47)

Divergence - over time, ADA scores for Democrats in "The South" are getting higher (more liberal)

Gerber & Lewis, "Beyond the Median: Voter Preferences, District Heterogeneity, and Political Representation," *Journal of Political Economy*, Dec 2004.

"Overwhelming empirical evidence shows that legislators regularly take positions that diverge significantly from the preferences of the median voter in their districts... Legislators are most constrained by the preferences of the median voter in homogeneous districts" (1364)

Background - looking at what legislators who compared to what people in their district want; have unique data set (2.8 million actual individual ballots) that allow them to determine what median voter in a district wants

Other Work - "Empirical studies may employ proxies of either citizen or voter preferences, depending on data availability and the nature of the specific question at hand" (1365); alternatives to median voter put the weight on...

- Nonmedian positions - Hinich (1977)
- Legislators' own ideal points - Wittman (1977), Calvert (1985), Alesina & Rosenthal (1996)
- Ideal points of campaign contributors - Stratmann (1995)
- Members of their parties & reelection constituencies - Fiorina (1974), Aldrich (1983), Peltzman (1984)
- Legislative leaders - Rohde (1991), Cox & McCubbins (1993), Aldrich (1995)
- Voters in other districts - Austen-Smith & Banks (1988), Snyder (1994)

Problem - all assume "influence of 'voter preferences' can be fully captured by a single statistic measuring mean or median voter preferences" (1366)

Data - 2.8 million ballots in Los Angeles county from 1992 general election

Issues - include 13 statewide ballot propositions, 4 national partisan candidate races (president, 2 senators, house of representatives), and local issues

Districts - includes 55 legislative districts, 24 California Assembly districts, 14 California Senate districts, 17 US House districts

Ideal Case - county includes inner-city urban, suburban, and semi-rural districts plus ethnically diverse and ethnically homogeneous districts

Model -

District Preference - builds on Lewis (2001) "technique for estimating the mean, median, and variance of the distribution of voter preferences within each of a set of predetermined groups (e.g., electoral districts) form data on a small number of observed binary choices" (1369)

Normalize - –1 liberal, 1 conservative

- **Partisans** - identify members of partisan subgroups, defined as those voters who voted for three same-party candidates (out of four) in the national partisan races
- **Legislator Behavior** - "A general finding of this literature is that a single left-right dimension accounts for a very large amount of the variation in legislators' roll call voting records" (1373)
  - **NOMINATE** - used Poole & Rosenthal's NOMINATE procedures to estimate left-right positions (–1 to 1 scale); this uses every vote (vs. ADA which only uses 20 votes)
  - **Standardize** - three different legislative bodies (state house, state senate, US senate); need to account for differences between agendas (e.g. different bills addressed by each body could be more liberal/conservative than other bodies so that a –0.3 in one body could be the same as a +0.2 in another); used ratings from three interest groups (League of Conservation Voters, the Chamber of Commerce, and the AFL-CIO) to standardize the NOMINATE scores
  - **Good Technique** - "Conditioning voting decision on the first-dimension NOMINATE score results in an overall classification success across all the roll calls of 89.7 percent" (1374)

Results - ran regressions of legislator's voting as dependent variable in several models (see Table 5 on next page):

- **Model 1** - only look at median preference in the legislator's district; get coefficient of 0.87 (or more conservative district leads to more conservative legislator, although slightly less extreme than the district)... supports median voter theorem... but only has R^2 of 0.37
- **Model 2** - adds party ideology for the respective legislative body; R^2 increases to 0.92 and median preference is statistically insignificant; coefficient on party ideology of 1.12 suggests legislator is more extreme than party... supports divergent party over median voter
- **Model 3** - adds interaction between median preference and variance to capture heterogeneity of district; "the effect of median preference decreases as heterogeneity (i.e., variance) increases" (1376); "In homogeneous districts, the district median is a good predictor of legislator behavior; as districts become more heterogeneous, the effects of legislative party become relatively more important." (1368)
  - **Problem** - if variance exceeds 2.6, legislator moves in opposite direction of median voter (e.g., more liberal median voter means legislator is more conservative)... not realistic
- **Model 4** - adds median partisan preference in district
  - **Problem** - "it is clear that model 4 is characterized by a high degree of multicollinearity" (1377)
- **Problems** -
  - (1) Really should be using Logit/Probit model because dependent variable is between –1 and 1
  - (2) Models 2-4 try to combine median voter and divergent platform models (just adding variables and not explicitly testing median vs. divergent); should estimate them separately (so each regression matches the corresponding theory) and then see which model gives the better fit
- **Overall** - great data, but "analysis isn't based on anything sensible"

TABLE 5

DETERMINANTS OF LEGISLATOR BEHAVIOR: OLS REGRESSION COEFFICIENTS (N=55)
Dependent Variable: Legislator's First-Dimension NOMINATE Score

Independent Variable	Model 1	Model 2	Model 3	Model 4
Median preference	.87	.09	.75	.86
	(.15)	(.07)	(.28)	(.31)
Party ideology		1.12	1.07	1.22
		(.06)	(.06)	(.19)
Median preference			−.29	−.30
× variance			(.12)	(.12)
Partisan preference				−.12
				(.15)
Constant	−.49	−.07	−.14	−.13
	(.09)	(.04)	(.05)	(.05)
R^2	.37	.92	.93	.93

NOTE.—Standard errors are in parentheses. Median preference and variance are as described in table 2. Party ideology is the median NOMINATE score of the members of a legislator's party delegation in his or her chamber. Partisan preference is Democratic median preference for Democratic legislators and is Republican median preference for Republican legislators (there are no Independent legislators in our sample).

Shifts in the Decisive Voter

Ways to alter median voter: poll tax, literacy test, election data

Husted & Kenny, "The Effect of the Expansion of the Voting Franchise on the Size of Government," *Journal of Political Economy*, Feb 1997.

Background - "elimination of poll taxes and literacy tests led to higher turnout, particularly among the poor, and a poorer pivotal voter" (54)

Redistribution - Meltzer & Richard (1983) predict poorer median voter would prefer more redistribution and chose larger government

Non-Redistribution - "governments do more than process welfare checks" (55); effect of poorer median voter on government services (education, defense, libraries, roads, parks, police, etc.) not known

Substitution Effect - the consumption is subsidized by richer members of the community

Income Effect - poorer median voter demands fewer government services

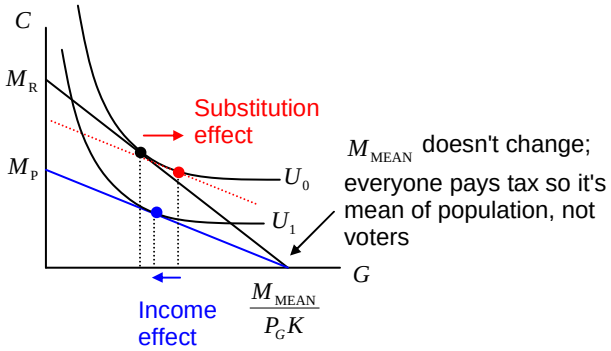
Example - go back to voter preference model from p.2 of "Median Voter Model" notes; slope of voter's budget constraint is:

$$-\left[P_G K \frac{M_i}{M_{\text{MEAN}}}\right]$$

Substitution Effect - $M_{\text{MED}} / M_{\text{MEAN}} \downarrow$ (slope is flatter) so G rises

Income Effect - $M_{\text{MED}} \downarrow$ (intercept is lower) so G falls

Net G depends on size of sub vs. income effect



M_{MEAN} doesn't change; everyone pays tax so it's mean of population, not voters

Kenny (*Public Choice*, 1978) extends work by Lovell (1975); "shows that expenditures on government services rise only if the elasticity of substitution between government services and private goods exceeds the income elasticity for government services" (55); elasticity of G wrt $M_i = (C / M_i)$ [income elasticity - elasticity of substitution] $\therefore$ $G \downarrow$ as $M_i \downarrow$ if income elasticity > elasticity of substitution (equivalent to income elasticity > price elasticity of government services)

Evidence -

Public Good	**Income Elasticity**	**Price Elasticity**
Education	0.34-0.68	0.07-0.48
Parks & Recreation	1.00	0.23-0.50
Police & Fire	0.60	0.20-0.70
Public Works	0.40-0.80	0.50-1.00
Total	0.60-0.75	0.23-0.68

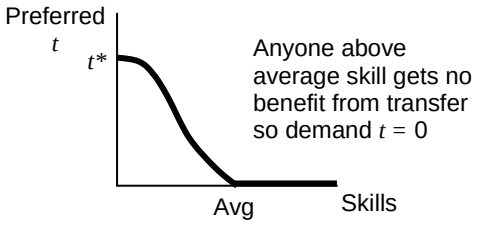
Income elasticity ≈ price elasticity so predict no change in demand for (non-welfare) government services

Redistribution Model - some government spending is purely redistributional (e.g., Aid to Families with Dependent Children [AFDC], Medicaid, Food Stamps)

Pure Redistribution Model - Meltzer & Richard (1978, 1981, 1983); all receive $X from government, financed by taxes proportional to income

Tax rate$\uparrow \Rightarrow$ fewer people work; workers work fewer hours $\therefore$ tax base falls

$\exists$ some tax rate t^* that maximizes tax revenue (maximizes payment from government); assume this is the level preferred by the poorest individuals (to max benefit)



Prediction - as decisive voter becomes poorer, preferred tax rate rises so welfare payment rises

Altruism Model - median voter, who is not a welfare recipient, is motivated by altruism toward the poor

Prediction - "fall in income of the median voter due to enfranchising the poor should lower welfare spending"; empirical tests of this theory by Orr (1976), Moffitt (1984) & Baumgardner (1993) have mixed results

Altruism & Self-Interest - Husted (1989), Epple & Romano (1996); allows redistribution to result form both altruism and self-interest; new median voter favors greater welfare payments, and redistribution increases if the new welfare recipient voters outnumber the other new poor voters (not welfare recipients)

Special Interest Group Model - Peltzman (1976), Becker (1983); vote-maximizing politicians balance votes gained from poor against votes lost from other groups; "Legislation that enfranchises more of the recipient population allows the poor to deliver more votes for favorable legislation without incurring any additional organizational cost and thus should result in greater welfare expenditures" (59)

Data - examine state and local government spending for nearly 3,100 counties using biennial data for 1950 to 1988; includes 46 states; "This sample allows us to estimate the effects of the removal by the federal government of two major impediments to voter participation in some states as a result of the Voting Rights Acts" (56)

Exclusions - Alaska and Hawaii excluded because no data in 1950, plus Alaska has double the spending of next highest state (from oil revenue); Minnesota excluded because nonpartisan elections through 1972; Nebraska excluded because nonpartisan elections during entire time period (precludes estimating state government party effects)

States - use "state-level data are used because most differences in redistributive policies occur at the state level" (64)

Model -

Change in Median Voter - looked at weighted average for state median income based on population and based on voter turnout

Results -

Poll Tax - empirical evidence shows turnout 15% lower with poll tax

Poll tax $\uparrow \Rightarrow \frac{\text{Voter Wtd M}}{\text{Pop Wtd M}} \uparrow$ (i.e., voting more in richer counties)

Causes welfare spending to be lower by 11-20%

Literacy Test - supposed to keep people who can't read/write from voting, but used selectively to keep out blacks in the South; same result as poll tax, but not as strong (only significant in 1 of 4 regressions); welfare spending lower by 13%

Democrat Control - 1 if Democrats control governor, state senate and state house; –1 if Republicans control all three; 0 if shared power; this assumes the increase in redistributive spending by Democrats is the same as the decrease by Republicans (imposes more structure and get more significant results)

Move from –1 to 1 increases welfare spending 5-12%

Pecquet, Coats & Yen, "Special Versus General Elections an the Composition of Voters: Evidence From Louisiana School Tax Elections," *Public Finance Quarterly*, Apr 1996.

Benefits of Voting - expect higher turn out for more "important" elections (i.e., more relevant to voters)

General Elections - state or federal issues

Special Elections - local issues, usually to decide education spending

Prediction - voters who get benefit (loss) from ballot measure will care more and turn out for a special election (i.e., parents & teachers who want more education spending) show up; voters with relatively small losses/gains will not show up

Data - look at Louisiana data from 1981 to 1991

Result - fewer voters in special elections; % of voters who favor higher taxes is 2-8% higher in special elections

Dunn, Reed & Wilbanks, *Public Choice*, 1997 - studied school elections in Oklahoma; schools had choice of when to have elections

Prediction - school board sets election dates to benefit them (i.e., more likely to get increased spending)

Result -

5% had election on same day as general election

3% had election over the summer (when kids aren't in school; compared to 17% of municipal bond elections)

Marketplace of Local Governments

Basic theory from, Tiebout, "A Pure Theory of Local Government Expenditures," *Journal of Political Economy*, Oct 1956.

Impact - it's only a 9 page article, but has been cited over 1300 times

Motivation - written to counter Musgrave & Samuelson's "The Pure Theory of Public Expenditures" (note similarities in titles; Tiebout was a "prankster" and was jabbing at Samuelson)

M&S Paper - claimed no "market type" solution determines level of government services (G) so is G non-optimal

Model - assumed G provided by a single central government

Optimum occurs where $\sum \text{MB} = \text{MC}$ (i.e., value of additional G = sum of willingness to pay = cost of additional G

Problem - hard to know how much G to provide unless you know households' willingness to pay; households will *understate* willingness to pay if this is linked to taxes owned $\therefore$ G is non-optimal

Contribution - Tiebout recognized there is a market for local governments which provides optimal levels of G

Local Government - provide mix of services (G): schools, municipal golf courses & tennis courts, beaches/pools, parks, roads, libraries, police, fire, etc.

Household Choice - household chooses from available (G,t) bundles; selects location that gives it the highest utility ("walks to a community..." usually stated as "votes with feet")

Key Assumptions:

- Household tax = marginal cost of providing G
- Households fully mobile (no restrictions due to employment opportunities)
  - **Realistic?** - scope of market for local governments has two types:
    Retired - not constrained by job so consider all local governments
    Working - limited by job; only looks at local governments in metro area
  - **Chicken vs. Egg** - Tiebout assumed people picked where they wanted to be and employment comes afterward; others (compensating wage literature) say wages are set in order to attract people to the jobs (e.g., pay more for working in a cold climate)
- Households have full knowledge of revenues (taxes) and expenditures of each community
  - **Evidence** - Tiebout points to Bell, "Familism and Suburbanization: One Test of the Choice Hypothesis," forthcoming (at the time) in Rural Sociology, Dec 1956 which indicates "a surprising awareness of differing revenue and expenditure patterns" (423)
- Large number of communities
  - **Constant Returns to Scale (CRS)** - means the number of communities $\geq$ number of preferred (G,t) mixes (i.e., get communities that are completely homogeneous [all members have same preferences], even it that means a single individual)
  - **Increasing Returns to Scale (IRS)** - means the number of communities < number of preferred (G,t) mixes (i.e., there is some factor or resource that is fixed; means some people won't find their preferred (G,t) mix, so they get as close as they can)
- No external economies or diseconomies between communities

Result - for local goods, there is a market solution (not the failure M&S claimed); people reveal their preferences when they choose their community (reflects true demand for G)

Testable Hypotheses -

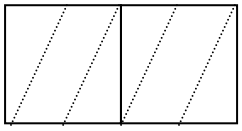
(1) "The greater the number of communities and the greater the variance among them, the closer the consumer will come to fully realizing his preference position." (418) (i.e., more communities $\Rightarrow$ each community is more homogeneous) **Jurisdictional Homogeneity**

(2) if household is dissatisfied with the inefficiency of local government, it can move to another city $\therefore$ competition among governments may make them more efficient (we'll examine this later)

Examples

 # Communities - consider number of school districts

Unified School District - contains all grades vs. separate districts for elementary and high school; from the picture here, this could be a single unified district with 2 high schools and 5 elementary schools, or it could be a single high school district (with 2 schools) and two elementary school districts (one with 2 schools and the other with 3 schools)



Florida - school districts are the same as the county; not much help for households who want to find a different school district (short of changing counties); "Tiebout doesn't live in Florida."

Courts - some states have court mandated equal spending rules; "The courts don't like Tiebout"

Los Angeles - school districts in Los Angeles Consolidated Metro Area in 1970

County	Elementary	High School	Unified
Los Angeles	34	6	42
Orange	18	4	8
Riverside	12	3	13
San Bern.	19	2	13
Ventura	14	3	4
Total	97	18	80

Household considering elementary school has 177 choices for districts
Household considering high school has 98 choices for districts

Income Only - if income where the only determinant of preferences, would gets a breakdown in communities similar to this:

Community	Level of G	Level of taxes
Rich	high	high
Middle	moderate	moderate
Poor	low	low

Cars - this is similar to the market for cars; each car has a different set of characteristics aimed at a different target market

Sorting - if desired G depends only on income, the number of communities will equal the number of income levels (perfect sorting by income); that ways each citizen gets preferred G (efficient solution)

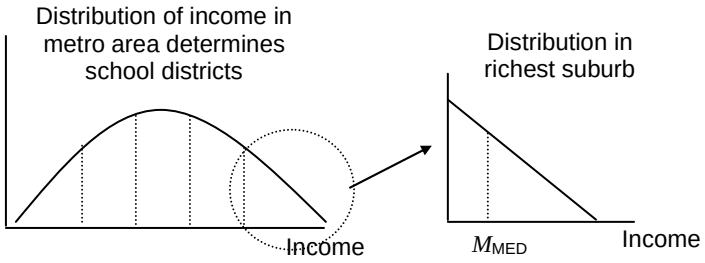
Redistribution - each community will have no variation in income so there will be no income redistribution (from previous notes: $M_{MED}/M_{MEAN} = 1$

Economies of Scale - problem with perfect sorting is that it ignores economies of scale (bigger communities makes some services less expensive)... leads to **trade-off** between preferences for G and economies of scale (stop when MB from economies equal MC)

Example - as schools become bigger...

+: In-school cost per student falls
    Fixed costs (e.g., library) are spread over more students
    Teachers can specialize more (e.g., math teachers)
    Specialized classes attract more students (e.g., calculus class is small school may not draw enough kids to justify the course, but could have enough students in a bigger school)
–: Other costs rise
    Transportation cost per student rises
    More variation in income within district (so fewer people are happy with G determined by the median voter)

"Semi-Tiebout" Equilibrium - some variation in income in each community



Suburbs - expect income distribution to define poor, middle income, and rich suburbs
Realistic? - this model has different distribution of income within each district... thanks to JC for pointing this out and complicating the notes
Redistribution - still have income redistribution in rich suburb ($M_{MED}/M_{MEAN} < 1$); richest person pays more property taxes than poorest rich guy... this is realistic
Expected Result - standard deviation of income within a district should be less than standard deviation for the metropolitan area (**Jurisdictional Homogeneity**)

Evidence for Jurisdictional Homogeneity

Eberts & Gronberg, "Jurisdictional Homogeneity and the Tiebout Hypothesis," Journal of Urban Economics, Sep 1981.
"If tastes are relatively constant across income classes and the income elasticity of demand for public goods is nonzero, then homogeneous grouping by public goods demand implies homogeneous grouping by income" (228)
Data - 34 SMSAs (Standard Metropolitan Statistical Areas) within 7 states (CA, IL, IA, MI, MO, NY, WI)
Unified School Districts - "provide mutually exclusive and coterminous delimiters of the SMSAs"; number of districts range from 2 to 39; "Assume educational services represent the dominant public goods factor in locational decisions" (232)
Income Distribution - calculated from 1970 Census (broken down by school districts)
Endogeneity Problem - "possibility of endogeneity is examined by first regressing the number of jurisdictions on dummy variables which are entered to represent the different policies and historical trends among the seven states included in the sample" (235)
English - predicted number of jurisdictions based on states
Problem - "really crude"; captures between state variation, but not within state variation; should've added the population of the SMSA as well

Result - "A positive relationship between the number of public goods jurisdictions and the degree of stratification (homogeneity) is suggested by the Tiebout model. For our sample, the empirical evidence supports the stratification hypothesis." (228)

Dependent Variable - Theil's entropy measure of income inequality; used to measure heterogeneity; "can be decomposed satisfactorily into the appropriate components of within and between community inequality measures" (233)

Interpretation - income inequality $\uparrow \Rightarrow$ district is more heterogeneous (less homogeneity); expect this to happen if there are fewer districts

Variable	Prediction	Result (t-stat)
# districts	–	–0.12 (5.88)
Avg size of district	+	0.0002 (1.93)
# families in SMSA	+	$-2\text{x}10^{-5}$ (3.76)
Problem - have three variables capturing two dimensions (# districts, avg size of district, and number of families in SMSA)... have multicollinearity problem		
% school revenue from state - reduces fiscal disparity; don't need to move to homogeneous district	+	0.09 (6.64)
% nonwhite in SMSA - trying to measure heterogeneity of community **Problem** - 50% is most diverse; above that the SMSA is getting more homogeneous (all nonwhite); should use Herfindahl Index	+	–0.24 (5.91)
% change in # households in SMSA - new people are less informed about districts; will be spread out so there is less homogeneity	+	0.03 (5.91)

others on p.236

Problem - lots of variables (and multicollinearity problem) for only 34 data points

Herfindahl Index - used to measure degree of homo/heterogeneity

Race - sum of squared racial shares (percentages); perfect homogeneity (all same race) returns value of 1; most heterogeneity is 1/(number of races)

Example - 3 races

Fully mixed $\rightarrow \sum\left(\frac{1}{3}\right)^2 = \frac{1}{3}$

One race $\rightarrow 1^2 + 0^2 + 0^2 = 1$

Property Values - used in Munley's paper

Schmidt, "Private Enrollment in Metropolitan Areas," *Public Finance Quarterly*, Jul 1992.

"The typical district is expected to be more heterogeneous in MSAs that leave fewer districts and thus have less complete sorting. As district heterogeneity rises, dissatisfaction with the quality of education chosen by the median voter grows and private enrollment increases"

districts $\downarrow \Rightarrow$ heterogeneity$\uparrow \Rightarrow$ private enrollment$\uparrow$

Model - want to look at relationship between income heterogeneity and private school enrollment; 3 endogenous variables so use 3 equation system

Public School Quality - proxied by expenditures (operating expenditures per pupil in the public school); "common assumption in the literature that the median voter chooses expenditures per pupil in a school district"

$\ln EXPEND = a_0 + a_1 \ln MEDINC + a_2 \ln SKEW + a_3 \ln OWN + a_4 \ln AVGED + a_5 \ln PRIV_p + a_6 \ln AID + a_7 TAXLIM + a_8 REVLIM + a_9 \ln CRIME + a_{10} \ln JULYTEMP + a_{10} \ln JANTEMP$

lnMEDINC - log of median family income (Census)
lnSKEW - log of median family income divided by mean family income (Census)
lnOWN - % of houses that are owner-occupied (Census)
lnAVGED - log of average education level of people 25 years and older (Census)
$\ln PRIV_p$ - log of fraction of students in grades K-12 enrolled in private school (Census)
lnAID - log of state aid per pupil (NCES)
TAXLIM - tax limited; 1 if district has a tax rate that is more than the state mean tax rate plus two standard deviations in a state with a limit
REVLIM - 1 if population growth in county is greater by two standard deviations than population growth in state when state has revenue increase limitation law
lnCRIME - log of number of serious crimes per 100,000 (City and County Data Book)
lnJULYTEMP & lnJANTEMP - log of average temperatures in January and July over 20 year period (Climates of the States)

Intradistrict Income Heterogeneity - use ln[OVERMED/(1 – OVERMED)], where OVERMED is fraction of families with incomes 100% above median; calculated at school district level, then averaged to the MSA level (Census)... influenced by Eberts & Gronberg (1981)

$\text{logi}OVERMED = b_0 + b_1 AVGSIZE + b_2 DIST + b_3 RACE + b_4 STATESH + b_5 PCHANGE + b_6 P18 + b_7 VARINC + b_8 REVLIM + b_9 TAXLIM$

AVGSIZE - area of MSA divided by number of school districts (Census, NCES)
DIST - predicted number of school districts (NCES)
RACE - sum of square shares for four "racial" groups (black, white, Asian, and Hispanic); calculated at MSA level (Census) ** this is Herfindahl Index
STATESH - state aid divided by total revenue (NCES)
PCHANGE - % people who did not live in the same MSA in 1975 (Census)
P18 - % of population age 18 or younger (Census)
VARINC - variance of income for the MSA as a whole (Census)

Private School Enrollment - secular school enrollment (also ran for religious schools); use ln[SEC/(1 – SEC)], where SEC is fraction of students in K-12 enrolled in secular private school (Census)

$\text{logi}SEC = c_0 + c_1 OVERMED_p + c_2 BLACK + c_3 EXPEND_p + c_4 AVGKIDS + c_5 REVLIM + c_6 TAXLIM + c_7 AID + c_8 CATH$

$OVERMED_p$ - predicted from second equation
BLACK - % of black in each district; averaged up to MSA level (Census)
$EXPEND_p$ - predicted from first equation
AVGKIDS - number of children in district divided by number of families averaged up to MSA level (Census)
CATH - % population that is Catholic; averaged up to MSA (Churches and Church Membership 1980)

Data - 129 MSAs using 1980 Census of Population data at school district level (National Center for Educational Statistics [NCES] Survey of Public School Finances, 1979-1980)

Result - "State policies that reduce choice among public school districts within metropolitan area, such as expenditure equalization policies, increase the degree of heterogeneity within each district, which, in turn, results in more secular private school enrollment."

Dependent Variable - for second equation is income heterogeneity (to make it comparable to Eberts & Gronberg's results)

Expect - variables that "increase the benefits and possibilities of sorting will decrease the within-district income variation in an MSA"

Result - "There is evidence that sorting by income exists across school districts"

Variable	Prediction	Result (signif)
# districts (DIST)	–	– (yes)
Variance of income (VARINC)	–	– (no)
Dispersion of races (RACE)	–	– (yes)
% 18 years and under (P18)	–	– (no)
Land area (AVGSIZE)	+	+ (yes)
% revenue from state (STATESH)	+	+ (no)
% new people (PCHANGE)	+	+ (yes)

Munley, "An Alternate Test of the Median Voter Model," *Public Choice*, 1982.

Innovation - other papers inferred same income implies same preferences (so use income heterogeneity of district to measure heterogeneity of preferences); Munley gets preferences from voting records (computes mean and standard deviation of actual preferences for government services)

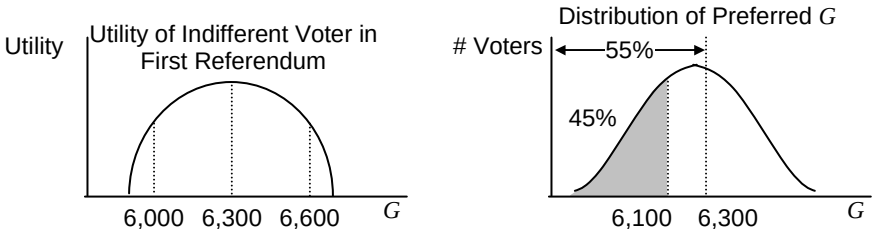
Holcombe, "An Empirical Test of the Median Voter Model," *Economic Inquiry*, April 1980 - examines voting on school referenda in Michigan (background for Munley's paper)

Voter Approval - raising tax rates requires voter approval; look at two referenda and, if you assume distribution of preferences, you could infer the mean and standard deviation of the distribution

Example - assume normal distribution of preferences (symmetric); also assume utility is symmetrical (so given two options person who's ideal point is in the middle is indifferent between them)

1st Referendum - G = 6,000 if proposal fails; G = 6,600 if it passes; suppose 55% of voters oppose 6,600; median voter's ideal is 6,300

2nd Referendum - G = 6,000 if proposal fails; G = 6,200 if it passes; suppose only 49% oppose it; median voter's ideal is 6,100



Use $\frac{x-\mu}{\sigma} \sim N(0,1)$ to find mean and standard deviation (since it's normal, the mean will also be the median)

$\frac{6{,}300-\mu}{\sigma} = 0.126 =$ NORMSINV(0.55) (inverse of cum standard normal)

$$\frac{6{,}100-\mu}{\sigma} = -0.025 = \text{NORMSINV}(0.45)$$

Two equations and two unknowns: $\mu = 6133$, $\sigma = 1325$

Result - Holcombe found spending is close to what median voter wants (based on his calculations of the median voter's preference)

Dependent Variable - Munley uses coefficient of variation ($CV = \sigma / \mu$) of preferred spending... should reflect all factors, not only income

Assumptions - uses four different sets of assumptions for symmetry of preferences and distribution:

$CV =$ linear demand curves (symmetry in spending), normal distribution

$CV_l =$ log-log demand curves (symmetry in log spending), normal distribution

$CV_L =$ linear demand curves, lognormal distribution

$CV_{lL} =$ log-log demand curves, lognormal distribution

Data - 54 New York state school districts with 2 referenda in 1975-76 academic year budget

Model - $CV_i = \alpha_0 + \alpha_1 NUM_i + \alpha_2 POP_i + \alpha_3 HRFL_i + u_i$

NUM - number of noncity school districts per square mile in the county within which the i^{th} district is located

POP - total population of the i^{th} district

HRFL - Herfindahl index of the dispersion of house values within the i^{th} district; "inasmuch as heterogeneous tastes for housing can proxy heterogeneous tastes in general, the effect of this variable is expected to be negative" (215)

Results -

Variable	Prediction	CV	CV_l	CV_L	CV_{iL}
# **districts** (NUM)	–	–	–	–	–
Size of district (POP)	+	+	+	+	+
Homogeneity of population (HRFL)	–	not significant			

Problem - would be nice to have descriptive statistics to interpret the coefficients

Marketplace of Local Governments

Basic theory from, Tiebout, "A Pure Theory of Local Government Expenditures," *Journal of Political Economy*, Oct 1956.

Impact - it's only a 9 page article, but has been cited over 1300 times

Motivation - written to counter Musgrave & Samuelson's "The Pure Theory of Public Expenditures" (note similarities in titles; Tiebout was a "prankster" and was jabbing at Samuelson)

M&S Paper - claimed no "market type" solution determines level of government services (G) so is G non-optimal

Model - assumed G provided by a single central government

Optimum occurs where $\sum \text{MB} = \text{MC}$ (i.e., value of additional G = sum of willingness to pay = cost of additional G

Problem - hard to know how much G to provide unless you know households' willingness to pay; households will *understate* willingness to pay if this is linked to taxes owned $\therefore$ G is non-optimal

Contribution - Tiebout recognized there is a market for local governments which provides optimal levels of G

Local Government - provide mix of services (G): schools, municipal golf courses & tennis courts, beaches/pools, parks, roads, libraries, police, fire, etc.

Household Choice - household chooses from available (G,t) bundles; selects location that gives it the highest utility ("walks to a community..." usually stated as "votes with feet")

Key Assumptions:

- Household tax = marginal cost of providing G
- Households fully mobile (no restrictions due to employment opportunities)
  - **Realistic?** - scope of market for local governments has two types:
    Retired - not constrained by job so consider all local governments
    Working - limited by job; only looks at local governments in metro area
  - **Chicken vs. Egg** - Tiebout assumed people picked where they wanted to be and employment comes afterward; others (compensating wage literature) say wages are set in order to attract people to the jobs (e.g., pay more for working in a cold climate)
- Households have full knowledge of revenues (taxes) and expenditures of each community
  - **Evidence** - Tiebout points to Bell, "Familism and Suburbanization: One Test of the Choice Hypothesis," forthcoming (at the time) in Rural Sociology, Dec 1956 which indicates "a surprising awareness of differing revenue and expenditure patterns" (423)
- Large number of communities
  - **Constant Returns to Scale (CRS)** - means the number of communities $\geq$ number of preferred (G,t) mixes (i.e., get communities that are completely homogeneous [all members have same preferences], even it that means a single individual)
  - **Increasing Returns to Scale (IRS)** - means the number of communities < number of preferred (G,t) mixes (i.e., there is some factor or resource that is fixed; means some people won't find their preferred (G,t) mix, so they get as close as they can)
- No external economies or diseconomies between communities

Result - for local goods, there is a market solution (not the failure M&S claimed); people reveal their preferences when they choose their community (reflects true demand for G)

Testable Hypotheses -

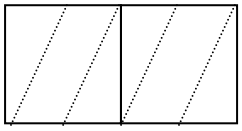
(1) "The greater the number of communities and the greater the variance among them, the closer the consumer will come to fully realizing his preference position." (418) (i.e., more communities $\Rightarrow$ each community is more homogeneous) **Jurisdictional Homogeneity**

(2) if household is dissatisfied with the inefficiency of local government, it can move to another city $\therefore$ competition among governments may make them more efficient (we'll examine this later)

Examples

 # Communities - consider number of school districts

Unified School District - contains all grades vs. separate districts for elementary and high school; from the picture here, this could be a single unified district with 2 high schools and 5 elementary schools, or it could be a single high school district (with 2 schools) and two elementary school districts (one with 2 schools and the other with 3 schools)



Florida - school districts are the same as the county; not much help for households who want to find a different school district (short of changing counties); "Tiebout doesn't live in Florida."

Courts - some states have court mandated equal spending rules; "The courts don't like Tiebout"

Los Angeles - school districts in Los Angeles Consolidated Metro Area in 1970

County	Elementary	High School	Unified
Los Angeles	34	6	42
Orange	18	4	8
Riverside	12	3	13
San Bern.	19	2	13
Ventura	14	3	4
Total	97	18	80

Household considering elementary school has 177 choices for districts
Household considering high school has 98 choices for districts

Income Only - if income where the only determinant of preferences, would gets a breakdown in communities similar to this:

Community	Level of G	Level of taxes
Rich	high	high
Middle	moderate	moderate
Poor	low	low

Cars - this is similar to the market for cars; each car has a different set of characteristics aimed at a different target market

Sorting - if desired G depends only on income, the number of communities will equal the number of income levels (perfect sorting by income); that ways each citizen gets preferred G (efficient solution)

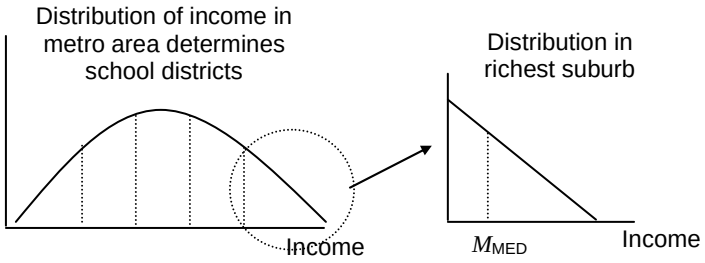
Redistribution - each community will have no variation in income so there will be no income redistribution (from previous notes: $M_{MED}/M_{MEAN} = 1$

Economies of Scale - problem with perfect sorting is that it ignores economies of scale (bigger communities makes some services less expensive)... leads to **trade-off** between preferences for G and economies of scale (stop when MB from economies equal MC)

Example - as schools become bigger...

+: In-school cost per student falls
    Fixed costs (e.g., library) are spread over more students
    Teachers can specialize more (e.g., math teachers)
    Specialized classes attract more students (e.g., calculus class is small school may not draw enough kids to justify the course, but could have enough students in a bigger school)
–: Other costs rise
    Transportation cost per student rises
    More variation in income within district (so fewer people are happy with G determined by the median voter)

"Semi-Tiebout" Equilibrium - some variation in income in each community



Suburbs - expect income distribution to define poor, middle income, and rich suburbs
Realistic? - this model has different distribution of income within each district... thanks to JC for pointing this out and complicating the notes
Redistribution - still have income redistribution in rich suburb ($M_{MED}/M_{MEAN} < 1$); richest person pays more property taxes than poorest rich guy... this is realistic
Expected Result - standard deviation of income within a district should be less than standard deviation for the metropolitan area (**Jurisdictional Homogeneity**)

Evidence for Jurisdictional Homogeneity

Eberts & Gronberg, "Jurisdictional Homogeneity and the Tiebout Hypothesis," Journal of Urban Economics, Sep 1981.
"If tastes are relatively constant across income classes and the income elasticity of demand for public goods is nonzero, then homogeneous grouping by public goods demand implies homogeneous grouping by income" (228)
Data - 34 SMSAs (Standard Metropolitan Statistical Areas) within 7 states (CA, IL, IA, MI, MO, NY, WI)
Unified School Districts - "provide mutually exclusive and coterminous delimiters of the SMSAs"; number of districts range from 2 to 39; "Assume educational services represent the dominant public goods factor in locational decisions" (232)
Income Distribution - calculated from 1970 Census (broken down by school districts)
Endogeneity Problem - "possibility of endogeneity is examined by first regressing the number of jurisdictions on dummy variables which are entered to represent the different policies and historical trends among the seven states included in the sample" (235)
English - predicted number of jurisdictions based on states
Problem - "really crude"; captures between state variation, but not within state variation; should've added the population of the SMSA as well

Result - "A positive relationship between the number of public goods jurisdictions and the degree of stratification (homogeneity) is suggested by the Tiebout model. For our sample, the empirical evidence supports the stratification hypothesis." (228)

Dependent Variable - Theil's entropy measure of income inequality; used to measure heterogeneity; "can be decomposed satisfactorily into the appropriate components of within and between community inequality measures" (233)

Interpretation - income inequality $\uparrow \Rightarrow$ district is more heterogeneous (less homogeneity); expect this to happen if there are fewer districts

Variable	Prediction	Result (t-stat)
# districts	–	–0.12 (5.88)
Avg size of district	+	0.0002 (1.93)
# families in SMSA	+	$-2\text{x}10^{-5}$ (3.76)
Problem - have three variables capturing two dimensions (# districts, avg size of district, and number of families in SMSA)... have multicollinearity problem		
% school revenue from state - reduces fiscal disparity; don't need to move to homogeneous district	+	0.09 (6.64)
% nonwhite in SMSA - trying to measure heterogeneity of community **Problem** - 50% is most diverse; above that the SMSA is getting more homogeneous (all nonwhite); should use Herfindahl Index	+	–0.24 (5.91)
% change in # households in SMSA - new people are less informed about districts; will be spread out so there is less homogeneity	+	0.03 (5.91)

others on p.236

Problem - lots of variables (and multicollinearity problem) for only 34 data points

Herfindahl Index - used to measure degree of homo/heterogeneity

Race - sum of squared racial shares (percentages); perfect homogeneity (all same race) returns value of 1; most heterogeneity is 1/(number of races)

Example - 3 races

Fully mixed $\rightarrow \sum\left(\frac{1}{3}\right)^2 = \frac{1}{3}$

One race $\rightarrow 1^2 + 0^2 + 0^2 = 1$

Property Values - used in Munley's paper

Schmidt, "Private Enrollment in Metropolitan Areas," *Public Finance Quarterly*, Jul 1992.

"The typical district is expected to be more heterogeneous in MSAs that leave fewer districts and thus have less complete sorting. As district heterogeneity rises, dissatisfaction with the quality of education chosen by the median voter grows and private enrollment increases"

districts $\downarrow \Rightarrow$ heterogeneity$\uparrow \Rightarrow$ private enrollment$\uparrow$

Model - want to look at relationship between income heterogeneity and private school enrollment; 3 endogenous variables so use 3 equation system

Public School Quality - proxied by expenditures (operating expenditures per pupil in the public school); "common assumption in the literature that the median voter chooses expenditures per pupil in a school district"

$\ln EXPEND = a_0 + a_1 \ln MEDINC + a_2 \ln SKEW + a_3 \ln OWN + a_4 \ln AVGED + a_5 \ln PRIV_p + a_6 \ln AID + a_7 TAXLIM + a_8 REVLIM + a_9 \ln CRIME + a_{10} \ln JULYTEMP + a_{10} \ln JANTEMP$

lnMEDINC - log of median family income (Census)
lnSKEW - log of median family income divided by mean family income (Census)
lnOWN - % of houses that are owner-occupied (Census)
lnAVGED - log of average education level of people 25 years and older (Census)
$\ln PRIV_p$ - log of fraction of students in grades K-12 enrolled in private school (Census)
lnAID - log of state aid per pupil (NCES)
TAXLIM - tax limited; 1 if district has a tax rate that is more than the state mean tax rate plus two standard deviations in a state with a limit
REVLIM - 1 if population growth in county is greater by two standard deviations than population growth in state when state has revenue increase limitation law
lnCRIME - log of number of serious crimes per 100,000 (City and County Data Book)
lnJULYTEMP & lnJANTEMP - log of average temperatures in January and July over 20 year period (Climates of the States)

Intradistrict Income Heterogeneity - use ln[OVERMED/(1 – OVERMED)], where OVERMED is fraction of families with incomes 100% above median; calculated at school district level, then averaged to the MSA level (Census)... influenced by Eberts & Gronberg (1981)

$\text{logi}OVERMED = b_0 + b_1 AVGSIZE + b_2 DIST + b_3 RACE + b_4 STATESH + b_5 PCHANGE + b_6 P18 + b_7 VARINC + b_8 REVLIM + b_9 TAXLIM$

AVGSIZE - area of MSA divided by number of school districts (Census, NCES)
DIST - predicted number of school districts (NCES)
RACE - sum of square shares for four "racial" groups (black, white, Asian, and Hispanic); calculated at MSA level (Census) ** this is Herfindahl Index
STATESH - state aid divided by total revenue (NCES)
PCHANGE - % people who did not live in the same MSA in 1975 (Census)
P18 - % of population age 18 or younger (Census)
VARINC - variance of income for the MSA as a whole (Census)

Private School Enrollment - secular school enrollment (also ran for religious schools); use ln[SEC/(1 – SEC)], where SEC is fraction of students in K-12 enrolled in secular private school (Census)

$\text{logi}SEC = c_0 + c_1 OVERMED_p + c_2 BLACK + c_3 EXPEND_p + c_4 AVGKIDS + c_5 REVLIM + c_6 TAXLIM + c_7 AID + c_8 CATH$

$OVERMED_p$ - predicted from second equation
BLACK - % of black in each district; averaged up to MSA level (Census)
$EXPEND_p$ - predicted from first equation
AVGKIDS - number of children in district divided by number of families averaged up to MSA level (Census)
CATH - % population that is Catholic; averaged up to MSA (Churches and Church Membership 1980)

Data - 129 MSAs using 1980 Census of Population data at school district level (National Center for Educational Statistics [NCES] Survey of Public School Finances, 1979-1980)

Result - "State policies that reduce choice among public school districts within metropolitan area, such as expenditure equalization policies, increase the degree of heterogeneity within each district, which, in turn, results in more secular private school enrollment."

Dependent Variable - for second equation is income heterogeneity (to make it comparable to Eberts & Gronberg's results)

Expect - variables that "increase the benefits and possibilities of sorting will decrease the within-district income variation in an MSA"

Result - "There is evidence that sorting by income exists across school districts"

Variable	Prediction	Result (signif)
# districts (DIST)	–	– (yes)
Variance of income (VARINC)	–	– (no)
Dispersion of races (RACE)	–	– (yes)
% 18 years and under (P18)	–	– (no)
Land area (AVGSIZE)	+	+ (yes)
% revenue from state (STATESH)	+	+ (no)
% new people (PCHANGE)	+	+ (yes)

Munley, "An Alternate Test of the Median Voter Model," *Public Choice*, 1982.

Innovation - other papers inferred same income implies same preferences (so use income heterogeneity of district to measure heterogeneity of preferences); Munley gets preferences from voting records (computes mean and standard deviation of actual preferences for government services)

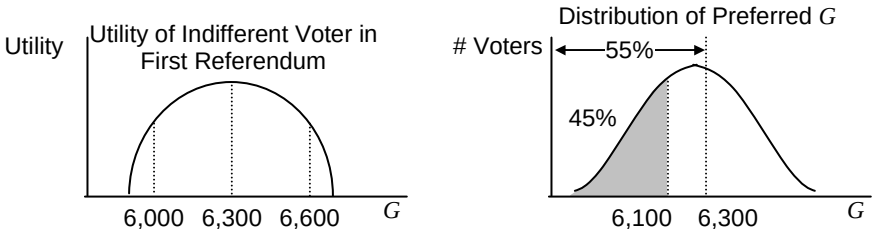
Holcombe, "An Empirical Test of the Median Voter Model," *Economic Inquiry*, April 1980 - examines voting on school referenda in Michigan (background for Munley's paper)

Voter Approval - raising tax rates requires voter approval; look at two referenda and, if you assume distribution of preferences, you could infer the mean and standard deviation of the distribution

Example - assume normal distribution of preferences (symmetric); also assume utility is symmetrical (so given two options person who's ideal point is in the middle is indifferent between them)

1st Referendum - G = 6,000 if proposal fails; G = 6,600 if it passes; suppose 55% of voters oppose 6,600; median voter's ideal is 6,300

2nd Referendum - G = 6,000 if proposal fails; G = 6,200 if it passes; suppose only 49% oppose it; median voter's ideal is 6,100



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Two equations and two unknowns: $\mu = 6133$, $\sigma = 1325$

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Data - 54 New York state school districts with 2 referenda in 1975-76 academic year budget

Model - $CV_i = \alpha_0 + \alpha_1 NUM_i + \alpha_2 POP_i + \alpha_3 HRFL_i + u_i$

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POP - total population of the i^{th} district

HRFL - Herfindahl index of the dispersion of house values within the i^{th} district; "inasmuch as heterogeneous tastes for housing can proxy heterogeneous tastes in general, the effect of this variable is expected to be negative" (215)

Results -

Variable	Prediction	CV	CV_l	CV_L	CV_{iL}
# **districts** (NUM)	–	–	–	–	–
Size of district (POP)	+	+	+	+	+
Homogeneity of population (HRFL)	–	not significant			

Problem - would be nice to have descriptive statistics to interpret the coefficients

Determination of Number of Governments

Endogeneity Problem - when looking for empirical evidence to support Tiebout's theory (i.e., increasing heterogeneity in metropolitan area leads to larger number of districts), need to worry about endogeneity

Problem States - 7 states have artificial restriction on number of districts:

Countywide Districts: FL, LA, MD, NV, VA, WV

Statewide District: HI

Florida had multiple districts until 1947 when state mandated countywide districts

Shrinking Districts - "Between 1950 and 1980 the number of school districts fell from 83,642 to 15,987" (Kenny & Schmidt 1)

Trade Off - lots of papers talk about trade-off in number of governments: "The cost of a particular quality of education was minimized by increasing school size until the gains from exploiting scale economies within the school were offset by the increase in transportation cost as the average student faced a longer trip to school." (Kenny & Schmidt 5)

Economies of Scale - cost savings

"Improved administrative efficiencies and equity in the delivery of locally-provided public services and allow for a greater degree of scale economies to be realized in the production of these services." (Nelson 443)

"Students in large school had higher achievement test scores than did students in small schools" (Kenny & Schmidt 5; citing a different Kenny paper)

"Large districts have economies of scale because they can provide libraries, sports facilities, and administration on a district wide basis" (Alesina 349)

Problem -

- "Preponderance of research in the past three decades.. has concluded that at least in some circumstances smaller jurisdictions (in terms of geographic size and in some instances in terms of scope of functional responsibilities) offer important advantages over larger jurisdictions." (Nelson 443)
- "According to the Leviathan hypothesis, reduced jurisdictional competition leads to increased government expenditures. We find some support for this hypothesis. States with very few districts have higher expenditures, certeris paribus, using one specification, but the coefficient is insignificant when a second specification is used." (Kenny & Schmidt 5)

Counter - "we found little evidence of diseconomies of scale" (Alesina 357)

Homogeneity - demand for choice

"A large number of competing governments will give individuals more choice... better accommodate differences in preferences for these services." (Nelson 444)

"Heterogeneity can be costly if different individuals have different policy preferences, so that they must compromise in order to share a jurisdiction. Heterogeneity is also costly if individuals prefer to interact with people like themselves, regardless of preferences over public policies." (Alesina 349)

Papers covering the number of governments:

Fisher & Wassmer, Journal of Urban Economics, 1998. (not in reading list)

Explain variation in number of cities and number of school districts

Sample - 165 metro areas in 1982

Hoxby, "Does Competition Among Public Schools Benefit Students and Taxpayers?" *American Economic Review*, Dec 2000.

"My results suggest that metropolitan areas with greater Tiebout choice have more productive public schools and less private schooling" (1209)

Rivers Paper - "I use instrumental variables based on topographics (specifically, streams) to identify natural differences in areas' propensity to have numerous school districts" (1210)

Idea - more obstacles ⇒ higher transportation cost ⇒ more districts

Problems -

- Size of streams (some very small)
- **Rothstein** - dissertation at Berkeley tried to reconstruct number of streams from Hoxby's paper (AER requires authors to make their data available); lots of judgment calls and Hoxby's result are very sensitive to the number of streams
- Population and land area not significant... could be correlated to number of streams

Kenny & Schmidt, The Decline in the Number of School Districts in the US: 1950-1980," *Public Choice*, 1994.

Examine variation across states in number of school districts: 1950, 60, 70, 80; "approach is closest to that of Nelson (1990)" (3)

Sample - 43 states that don't require countywide or statewide districts; 43*4 = 172 observations using state data and US Census data

Result - # districts fell from 84,000 (49-50) to 16,000 (80-81); reasons:

Drop in farm population & increase in population density (biggest drop in West North Central farming states: IA, KS, MN, MO, NE, ND, SD)

Growing state aid (reduced quality variation among districts)

Increase in fraction of teachers in NEA

Cost of Regulation - compared predicted number of districts to actual number in the 7 states mandating countywide and statewide school districts

Nelson, "Decentralization of the Subnational Public Sector: An Empirical Analysis of the Determinants of Local Government Structure in Metropolitan Areas in the U.S." *Southern Economic Journal*, Oct 1990.

Explained variation across metro areas in number of governments (general purpose and special districts)

Sample - 296 metro areas in 1982

Schmidt, 1989 dissertation

Explains variation across metro areas in number of school districts in 1980

Sample - 113 metro areas without county wide districts

Determinants of Number of Governments

(1) **Income Heterogeneity** - heterogeneity ↑ ⇒ # districts ↑

"I assume the intuition on that is reasonably obvious"; this is basically what we looked at last time: heterogeneity leads to more districts

Nelson Paper - variance of income ↑ ⇒ # districts ↑; variance in age not significant

Kenny & Schmidt Paper - depends on state share

INCOME RATIO - difference between third and first quartiles of family income distribution, divided by the second quartile (median income); expect +; get +

$$\ln(\#\text{DISTRICTS}) = \ldots + 2.76\ \text{INCOME RATIO} + 4.376\ \text{STATE SHARE} - 6.789\ \text{INCOME RATIO} * \text{STATE SHARE}$$

$$\partial(\cdot)/\partial(\text{INCOME RATIO}) = 2.76 - 6.789\ \text{STATE SHARE}$$

∴ effect is + if STATE SHARE < 0.41 (average) (i.e., greater desire to sort by income when state not as involved in education)

Fisher & Wassmer Paper - pooled income, race, and age variation

If all 3 are 2σ below mean (homogeneous), predict 5 cities; 1 school district

If all 3 are 2σ above mean (heterogeneous), predict 101 cities, 54 school districts

(2) **State Share** - share ↑ ⇒ # districts ↓

More state aid reduces quality variation among districts

Kenny & Schmidt Paper -

STATE SHARE - fraction of public elementary and secondary education revenues coming from the state; expect –; results (see equation above)

$\partial(\cdot)/\partial$(STATE SHARE) = 2.76 – 6.789 INCOME RATIO

∴ effect is – if INCOME RATIO > 0.64 (that's most of sample: mean 0.89, standard deviation 0.16)

FEDERAL SHARE - same for federal money; expect –; insignificant

(3) **State Regulation** - regulation ↑ ⇒ # districts ↓

More local governments if more autonomy (e.g., if both city and county must vote individually to merge, the usually won't; vs. Texas where Houston annexed most of the county)

Kenny & Schmidt Paper - predict number of districts for states that mandate countywide districts (much higher than 1 per county)

Table 5. **Effects of state-wide and county-wide laws on the number of school districts**

	Restricted values				Predicted values			
	50	60	70	80	50	60	70	80
Florida	67	67	67	67	515	490	328	567
Hawaii	1	1	1	1	•	32	13	20
Louisiana	67	67	66	66	237	213	163	178
Maryland	24	24	24	24	377	214	158	140
Nevada	•	17	17	17	•	74	80	124
Virginia[a]	127	131	134	140	777	428	256	274
West Virginia	55	55	55	55	119	80	61	71

"The lack of effective competition is estimated to raise expenditures by 68 dollars (1967) per pupil, or 12 percent on average." (Kenny & Schmidt 15)

(4) **County Influence** - influence ↑ ⇒ # districts ↓

Similar to state share argument (South has more involved counties; New England states have very little county involvement)

Fisher & Wassmer Paper - states with larger share of spending by county government (vs. local government) have smaller number of districts

(5) **Population of Metro Area** - population ↑ ⇒ # districts ↑ (and size of districts ↑)

With constant density expect elasticity of school districts with respect to population to be one (i.e., double population ⇒ expect double # districts)

Double Benefits - get more districts (should be more homogeneous) and get bigger districts (benefit from scale economies)

Schmidt Paper - calculated elasticity of number of governments wrt metro population as 0.8 (i.e., 10%↑ in population ⇒ 8% rise in # governments)

Kenny & Schmidt Paper -

POPULATION - state population; expect +; result + (can't reject hypothesis: = 1)

Population	FL Examples	Districts (in "rest of the world," not in FL)
< 100K		5-6
100K-400K	Gainesville, Daytona, Pensacola	11
400K-100K	Lakeland, Winter Haven, Sarasota	19
700K-1M	West Palm Beach, Jacksonville	30
> 1M	Miami	60

(6) **Transportation Cost** - cost ↓ ⇒ # districts ↓

Lower cost makes it easier to take advantage of scale economies:

Decline in farm population

Increase in population density (or increase in school age population)

Kenny & Schmidt Paper -

HIGHWAY - number of rural highway miles per square mile; expect –; insignificant

DENSITY - population per square mile; expect –; get –

SCHOOL AGE POP - ratio of school age population to local population; expect –; get –

FARM - fraction of labor force who are farm operators and farm managers; expect +; get +

Other - from Kenny & Schmidt paper

TEACHER UNION - ratio of state's NEA members to number of private and public elementary and secondary teachers; expect –; – (barely insignificant)
(% union ↑ ⇒ # districts ↓)

PRIVATE SCHOOL - fraction of primary and secondary students in private schools; draws upper tail of income distribution which increases homogeneity among students in public schools and reduce demand for additional districts; expect –; insignificant
(% private ↑ ⇒ # districts ↓)

Discussion Article

Alesina, Baqir & Hoxby, "Political Jurisdictions in Heterogeneous Communities," *Journal of Political Economy*, April 2004

Background - consider different measures of heterogeneity: income, race, ethnicity & religion to test for number of school districts, attendance areas, municipalities, and special districts

"There is a fundamental trade-of that shapes jurisdictions... between the benefits of larger scale and the costs of a more heterogeneous population" (349)

Previous Research? - "Previous tests of the Tiebout model have always taken the number of jurisdictions as given..." (351)... obviously didn't read Kenny & Schmidt (1994)

Attendance Area vs. School District - "households can build another school within their district... it does not allow different groups of people in the district to independently control or finance their schools... [but] lower fixed cost than creating a new district" (356)

Model -

State Laws - used state fixed effects to deal with differences in state laws and state constitutions

Model Predictions -

districts increasing in benefits of public good (willing to pay more to avoid having a school that is far away in terms of distance or tastes)

districts increasing in disutility of distance

districts decreasing in importance of economies of scale

districts increasing with higher heterogeneity
districts increasing in population

Integer Problem - could have factors change that would suggest new district, but has to cross threshold level because of integer problem

Empirical Model -

$$\ln N = \text{const} + a_1 \ln \mathbf{h} + a_2 \ln \mathbf{g} + a_3 \ln \mathbf{k} + a_4 \mathbf{p}$$

N = number of jurisdictions

h - heterogeneity... use income, racial, ethnic, and religious indices

g - preference for public good... include county's mean income, % adults with HS education, % adults with college, % over 65, % industry employment

k - proxy for fixed costs... "we use natural boundaries for jurisdictions: streams" (359); also used state indicators to capture fixed costs from laws

p - measures of population and density in parts of the county; used 4 categories of density: low (< 1,000/sq.mile), medium (1,000-10,000/sq.mile), high (10K-50K/sq.mile), very high (>50K/sq.mile); and 5 categories for population (total of 20 terms)

Data - "Although much of our data come from U.S. Censuses of Population, we use data fro more than 50 sources" (360)

Cross Section - 1990 Census data ("most detailed") based on counties because "they almost never consolidate or break apart and local jurisdictions rarely traverse county lines" (350)... i.e., stable boundaries

2718 counties (of 3100+; removed states with mandated countywide and statewide districts)

Panel Data - 1960 to 1990; "jurisdictional consolidation and secession were slow during this period" (363)

World Wars - look at single decades: 1910-20 and 1940-50; "we examine only school districts because we were unable to find sufficient information on municipalities and special districts" (363)

Results -

"We find strong evidence of a trade-off between economies of scale and racial heterogeneity; we also find evidence of a trade-off between economies of scale and income heterogeneity. Conversely, we find little evidence that ethnic or religious heterogeneity shapes jurisdictions" (348)

Income - used Gini coefficient; expect +

"We obtain similar results using the Theil index, the coefficient of variation, and ratios of income deciles" (360)

Expect +; $2\sigma\uparrow \Rightarrow$ school districts $\uparrow$ 8% (attendance areas $\uparrow$ 4%)

Race - used 1 – Herfindahl (i.e., 1 – sum of $(\text{group}_i)^2$); 5 groups: white non-Hispanic, black non-Hispanic, Asian & Pacific Islander, Native American, and Hispanic

Expect +; $2\sigma\uparrow \Rightarrow$ school districts $\uparrow$ 10% (attendance areas $\uparrow$ 9%)

Ethnicity - used 1 – Herfindahl; "Ethnic groups within the black, Asian, and Native American populations are too small to be usable" (362) $\therefore$ only used white (Hispanic) groups (didn't specify which groups)

Expect +; not significant for school districts; + for attendance areas ($2\sigma\uparrow \Rightarrow \uparrow$ 6%)

Religion - used 1 – Herfindahl

Expect +; not significant for school districts; + for attendance areas ($2\sigma\uparrow \Rightarrow \uparrow$ 15%)

Problem - not much variation in using these 17 groups and some groups are more prominent in some areas and virtually non-existent in others (see quote about ethnic groups being too small); probably better mix with 5 groups: Catholic, Protestant, Jewish, Muslim, Asian; Could break up Protestant based on big differences: Liturgical Protestant, Evangelical Protestant, Mormon, SDA... key is finding real differences between groups)

Causality (Endogeneity) - "We have presented the model as though an area's population is exogenously determined and the number of jurisdictions responds endogenously" (359)

Time Series - look at changes in jurisdictions by looking at panel evidence; are changes in population heterogeneity associated with changes in the number of jurisdictions?; effectively eliminates county fixed effects (first-differenced equation used in cross section regression)

Problem - table 5 dropped % of adults with college degree; could be because it's highly correlated with income (was insignificant in 1990 regression) or because big change from 1960 to 1990... authors didn't explain why it was dropped

Result - "The relationship is, indeed, upward sloping. Racial heterogeneity at the beginning of the period does appear to prevent consolidation" (375)

Exogenous Shock - "We find [credibly exogenous changes in heterogeneity] in the shocks to certain counties' racial heterogeneity that occurred during World wars I and II. In the two 'Great Black Migrations'..." (360); look at counties with significant rise in % black and match with similar counties for comparison

13 counties in WWI, 32 in WWII

Result - increased number of school districts (5% more after WWI; 4% more after WWII); "The counties affected by the Great Black Migration resisted district consolidation more than similar counties that were unaffected" (380)

Robustness Problem - % over 65 (and other variables) bounce around from regression to regression

See Leemer, "Taking the Con out of Econometrics"

"Beat it to death school of research"

Table 2 - Effect of population heterogeneity on the number of school districts in a county

Table 3 - Effect of school-aged population heterogeneity on the number of school attendance areas

Table 4 - Effect of the number of school districts and school attendance areas on the heterogeneity that people actually experience

Table 5 - Effect of changes in population heterogeneity on changes in the number of school districts in a county between 1990 and 1960

Table 6 - Effects of racial heterogeneity shocks generated by world war industry demands

Table 7 - Effect of population heterogeneity on the number of municipalities and special districts in a county

Table 8 - Effect of changes in population heterogeneity on changes in the number of municipalities and special districts, 1960-1990

Private School Demand

Median Voter - with no restrictions on public spending, the median voter determines the quality of public schools (G ... generic measure of school quality; can think of it as total expenditures, student-teacher ratio, % teachers with masters degrees... whatever you want to think of as "quality")

- **Preferred Quality** - each voter's preferred level of quality is determined by the tangency between his indifference curve and budget constraint
- **Public School Quality** - quality that results from election will be the preferred quality of the median voter, G_{MED}

Semi-Tiebout Equilibrium - there will be some variation in preferences within each district $\therefore$ some households aren't getting their preferred G (either too much or too little)

- **Too Much** - can't really do anything about it; school quality is provided by tax dollars so marginal cost is zero (will consume the additional quality); can't avoid paying taxes if they're too high except by moving
- **Not Enough** - if a household doesn't think G_{MED} is high enough, there's the option of private school

Private School - in this model, only those households that prefer higher quality than what the public system provides use private school (i.e. $G_{\text{PREF}} > G_{\text{MED}}$)... i.e., only richer households will use private schools

- **Higher Demand** - if richer households paid the same price for G, they'd demand more than G_{MED}
- **Price for Private** - price of sending each kid in household i to private school is: $P_{\text{PVT}} = P_G K_i$, where K_i = # kids in the household
- **Public Price** - the only price relevant for public schools is the price to the median voter; $P_{\text{MED}} = P_G K_{\text{PUB}} \dfrac{M_{\text{MED}}}{M_{\text{MEAN}}}$, where K_{PUB} = # kids in public school per household
- **Private > Public** - households using private school face a higher price for two reasons:

  $\dfrac{M_{\text{MED}}}{M_{\text{MEAN}}} < 1$... income distribution is skewed left so public schools are subsidized

  $K_{\text{PUB}} < K_i$ ... not as clear; look at K_{PUB}: (<u>Assumes</u> all hhds have same # kids)

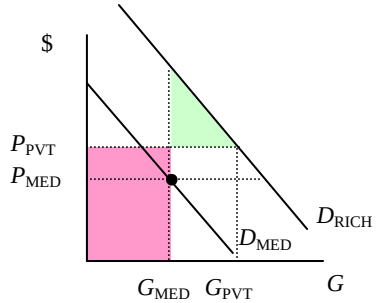
$$K_{\text{PUB}} = \frac{\#\text{hhds}\left(\dfrac{\text{hhds in public school}}{\#\text{hhds}}\right)\left(\dfrac{\#\text{kids}}{\#\text{hhds}}\right)}{\#\text{hhds}} = (\%\text{hhd in public school})K_i$$

  As long as there are some kids in private school, %hhd in public school < 1

  $\therefore\ K_{\text{PUB}} < K_i$

Who Uses Private - in order to use private school, the surplus from school quality above the quality of public school (the green triangle) must exceed the expenditure on private school required to replicate public school (the pink rectangle); that means households that use private school must be a good deal richer than the median voter

- **Duplicate Public** - household using private school must pay $P_G K_i G_{\text{MED}}$ to duplicate the quality provided publicly (pink area); this is a **fixed cost** of using the private sector



Cost per Student - drop the K_i from the formulas (so we're not dealing with the pink and green areas directly)

Duplicate Public - the amont of private school tuition needed (per student) to replicate the school quality chosen by the median voter is $P_{\text{PVT}}G_{\text{MED}}$

Problem - private school tuition for G_{MED} can't be observed (because the people who demand private school will demand a higher quality, no private schools will offer G_{MED})

Solution - $P_{\text{PVT}}G_{\text{MED}} = P_{\text{PUB}}G_{\text{MED}} + (P_{\text{PVT}} - P_{\text{PUB}})G_{\text{MED}}$

The private school tuition for G_{MED} is equal to the public school expenditure per student plus the cost different between public and private schools (this could be > 0 or < 0)

Implication - should use:

(a) private school tuition for fixed quality (i.e., $P_{\text{PVT}}G_{\text{MED}}$); this is hard to measure

(b) public school expenditure per student + measures of cost differences ($P_{\text{PUB}}G_{\text{MED}} + (P_{\text{PVT}} - P_{\text{PUB}})G_{\text{MED}}$)

Problem 1 - should <u>never</u> include private tuition and public expenditure per student as explanatory variables in the same regression (they're highly correlated)

Problem 2 - private tuition (or enrollment) and public expenditure per student are jointly chosen (i.e., <u>endogenous</u>); we'll deal with this later

Proxies for Cost Diff - several ways people try to measure the cost difference between private and public ($(P_{\text{PVT}} - P_{\text{PUB}})G_{\text{MED}}$)

- **%Catholic** - captures private school subsidies from churches
- **%Union** - teacher unions in public school raise salaries (higher cost) and establish work rules that are not efficient
- **Competition** - between public school districts, between public and private schools, between public and charter schools; we'll cover this later
- **Population Density** - less dense $\Rightarrow$ cost$\uparrow$ (private schools can't take advantage of scale economies while public schools have advantage because transportation for kids is subsidized)

Endogeneity Problem - simultaneous determination of % attending private school and public school expenditure

$P_G G \uparrow \Rightarrow$ % private$\downarrow$

As public expenditure per student ($P_G G$) rises, the fixed cost of replicating public school quality per student goes up; that means fewer households will want private school

% private$\uparrow \Rightarrow P_G G$? (could go either way)

(1) Cost to any voter of raising public school quality: $P_i = P_G K_{\text{PUB}} \dfrac{M_i}{M_{\text{MEAN}}}$

Scaling Effect - % private $\uparrow \Rightarrow K_{\text{PUB}} \downarrow \Rightarrow G \uparrow$ (fewer public school kids per taxed household so cost of raising public school quality falls and public expenditure rises)

(2) Shift in median voter as more in private school; households that preferred high quality public school now wants to minimize taxes paid for other kids so they

essentially vote as zero income (want zero tax); further skews distribution of preferred G to the left so new median voter wants $G\downarrow$

(3) Tiebout endogeneity - those choosing private school have incentive to relocate within metro area to areas with low G and low taxes for public school $\therefore$ find higher % private in low G districts

Easy to Avoid - use % private for metro area (not for districts)

Papers

Martinez-Vazquez & Seaman, *Public Finance Quarterly*, July 1985

Sample - 75 large MSAs in 1970

Contribution - aware of simultaneity between % private and public expenditure per student; OLS and 2SLS get same results

Hamilton & Macauley, *Journal of Urban Economics*, May 1991

Sample - 450 New Jersey school districts in 1980 (no rural or large cities)

Contribution - first to test if private school demand comes from imperfect Tiebout world

Schmidt, *Public Finance Quarterly*, July 1992 (covered in "Marketplace of Local Governments" notes)

Sample - 129 MSAs in 1980 (consistent data in multiple sources)

Contribution - estimates 2SLS for % private and public expenditure per student

% Private Regression - several variables only included in this regression (and not in public expenditure regression)

%($M_i > 2M_{MED}$) (i.e., % population 100% above median income) - captures heterogeneity of income

% Catholic - captures subsidies

% Black - captures desire to avoid integration

Public Expenditure Regression - several variables only included in this regression (and not in % private regression)

M_{MED}/M_{MEAN} - captures price to median voter

Average Education - captures parental skills (as determinant of demand for school quality)

Crime and **Climate** - capture compensating wage differentials for teachers

2SLS Results -

% private has significant positive impact on expenditure (scaling effect dominates)

Public expenditure...

Raises secular private enrollment... wrong sign!

No impact on religious private enrollment

Figlio & Stone, *Journal of Urban Economics*, Mar 2001

Sample - 15093 students in National Education Longitudinal Study

Contribution - use public student-teacher ratio to measure cost of duplicating public school quality

Husted & Kenny, Southern Economic Journal, Jan 2002

Sample - 159 metro areas in 1970, 1980, & 1990 (had to be metro in all 3 years, only cover 1 state, & showed consistency in definition of borders)

Contribution - use average expenditure per student in the *state* (exogenous to district) to measure cost of duplicating public school quality

Determinants of Private School Demand - all + and – refer to effect on % private

(1) **Income Heterogeneity** - testing potential for high demand curves to have green area > pink area; expect income heterogeneity ↑ ⇒ % public ↑

Hamilton & Macauley - standard deviation of income; + (i.e., $\sigma_M \uparrow \Rightarrow$ % private↑)

Schmidt - % families ($M_i > 2M_{\text{MED}}$) ⇒ + for secular; not significant for religious

Figlio & Stone - concentration of public schools ⇒ +

Husted & Kenny - # districts (assumes # districts ↑ ⇒ homogeneity of districts ↑ ⇒ less kids in private school) ⇒ – (this is the same as the others: more heterogeneity yields more % private)

Mandated Equal Spending Law - reduces σ_{spending} so expect % private ↑

(2) **Public Expenditure per Student** - measures fixed cost of replicating public quality with private school (bottom part of pink area in the graph, but per kid); expect $P_G G \uparrow \Rightarrow$ % private↓

Hamilton & Macauley - didn't address

Schmidt - Public expenditure ⇒ + (wrong sign!)

Figlio & Stone - State expenditure per student ⇒ –

Husted & Kenny - Class size ⇒ + (large class size in public school leads to higher demand for private school)

(3) **Kids per Family (K_i)** - more kids in family makes private school even more expensive compared to public school; expect $K_i \uparrow \Rightarrow$ %private↓

Hamilton & Macauley - average household size ⇒ – (not significant)

Schmidt - $K_i \Rightarrow$ –

Figlio & Stone - # siblings ⇒ –

Husted & Kenny - kids ever born to women 30-44 ⇒ not significant

(4) **Public-Private Cost Difference** - 4 proxies for cost difference between private and public listed on p.2 ($(P_{\text{PVT}} - P_{\text{PUB}})G_{\text{MED}}$); expect diff ↑ ⇒ % private ↓

Religion - all papers use % Catholic; + and significant in all papers

Hamilton & Macauley - population density (cost diff ↓) ⇒ +

Schmidt -

Figlio & Stone - % union - not significant

More specific on religion:

+ - Catholic, Episcopalian, Eastern Orthodox, Jewish

– - Pentecostal

Not significant - Methodist, Lutheran, Presbyterian

Husted & Kenny - log density ⇒ +

(5) **Income** - theory says median income affects public school expenditure (already included this in (1) so don't need to explicitly include income, unless you assume religious training is a normal good in which case you may want to include income for % religious private

(6) **%Black** - expect quadratic; low and high values should have low % private; middle values (high heterogeneity) have more private

Hamilton & Macauley - + for K-6; not significant for 7-12

Schmidt - +

Figlio & Stone - not significant

Husted & Kenny - no effect in 1970; + in 1980 & 1990 (argue it's response to bussing)

Education Production Function

Theory

Dewy, Husted & Kenny, "The Ineffectiveness of School Inputs: A Product of Misspecification?" *Economics of Education Review*, 2000.

Why - need to understand the production of knowledge in order to evaluate policy debates surrounding education (e.g., does competition make schools more efficient?)

Parent's Utility - based on education vs. everything else: $U(L,C)$ (1)

$L =$ amount child learns

$C =$ other consumption

Education - production function: $L = f(S, t_L, E)$ (2)

$S =$ quality of the school system

$t_L =$ parents' quantity of time teaching child

$E =$ parents' educational attainment (proxy for quality of time)

Problem - learning occurs over many years, but this model doesn't incorporated learning over time; in a perfect world, we'd have data on inputs over time

Other Consumption - production function: $C = g(X, t_c, E)$ (3)

$X =$ amount of goods purchased

$t_C =$ time devoted to other consumption

This is based on economics of the household framework by Becker (1960s)

Budget Constraint -

Time Budget Constraint - $T = t_L + t_C + t_W$ (4)

$t_W =$ time spent working

$T =$ available time

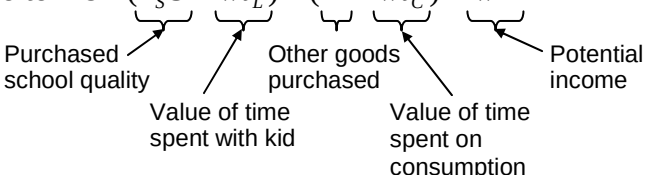
Goods Budget Constraint - $P_S \cdot S + X = w \cdot t_W$ (5)

$P_S =$ price of school quality

$w =$ hourly wage rate

Sub (4) into (5): $P_S \cdot S + X = w \cdot (T - t_L - t_C)$

Rearrange terms: $(P_S S + wt_L) + (X + wt_C) = wT$ (6)



Parent's Problem - maximize utility subject to production functions and budget constraint

$\max U(L,C)$	utility (1)
s.t. $L = f(S, t_L, E)$	education production function (2)
$C = g(X, t_c, E)$	consumption production function (3)
$(P_S S + wt_L) + (X + wt_C) = wT$	budget constraint (6)

Solution - determines demand functions for the two outputs (L, C) and their inputs:

Outputs: $L = D_1(T, w, P_S, E)$, $C = D_2(T, w, P_S, E)$

Inputs: $S = D_3(T, w, P_S, E)$, $X = D_4(T, w, P_S, E)$, $t_L = D_5(T, w, P_S, E)$, $t_C = D_6(T, w, P_S, E)$

Linear Assumption - is we linearize education production function:

$L = b_0 + b_1 S + b_2 t_L + b_3 E$ (7)

Problem - no data set has all these variables; data sets with information on school quality (S) are usually missing information on parental time helping kids (t_L)

Options - four ways of dealing with lack of data on t_L

(a) **Time Working** - t_W is negatively correlated with t_L (i.e., if parents' work more, they probably spend less time teaching their kids)

(b) **Hourly Wage** - common practice in literature: $L = b_0 + b_1 S + b_3 E + b_4 w$ (8)

Either use hourly wage (w) or income

Problem -

- w is poor proxy for t_L ... conflicting income and substitution effects
  Income - income$\uparrow \Rightarrow$ demand for leisure$\uparrow$
  Substitution - income$\uparrow \Rightarrow$ opportunity cost for leisure$\uparrow \Rightarrow$ demand for leisure $\downarrow$
- mixing production function input (S) with demand function input (w); these variables are highly correlation since S is a function of w (rich communities demand high quality school systems); introduces multicollinearity

(c) **Ignore Time with Kids** - $L = b_0 + b_1 S + b_3 E$ (9)

Effect of t_L will be captured by error term, but Rosen & Flyer (*Journal of Labor Economics*, 1997) find positive correlation between female labor force participation and school quality (i.e., women who work substitute S for t_L); R&F found positive correlation between work time and S, which implies negative correlation between t_L and S so there will be a negative bias on the coefficient of S on (9)... less likely to see importance of school quality on learning

(d) **Instrumental Variable Approach** - estimate demand for $S = D_3(T, w, P_S, E)$ (demand function from bottom of p.1); use predicted values of S in production function

$L = b_0 + b_1 \hat{S} + b_3 E$ (10)

Now coefficient on $\hat{S}$ is unbiased

Problem - good IVs are hard to find

Evidence

Dewy, Husted & Kenny - summarize literature: 127 regressions explaining test scores from 46 papers; allow different samples (e.g., elementary and high school), and separate dependent variables (e.g., reading and math scores), but only use "best" regression for each case

Bad Models - 92 of 127 regressions were bad, because...

had no measure of parental time (t_L or E) [14], or

included income or wage (w) [85] (i.e., used demand variable in production function)

Inputs - all variables are (should be) inputs to production function so they should have positive coefficients

Meta-Analysis - combine 414 coefficients from all 127 regressions:

	Good Studies	**Bad Studies**
Positive Coefficients	75.2%	66.7%
+ & Sig @ 5.0% (1 tail)	41.9%	35.0%
+ & Sig @ 2.5% (1 tail)	38.1%	27.5%

Good vs. Bad - good studies are more likely to have positive and significant coefficients
Overall - overall measure of significance obtained using inverse chi-square test (also known as Fisher or Pearson P_λ); by combining all coefficients from all papers (good and bad) the following inputs all have significantly positive effects: teacher education, teacher experience, teacher salary, other teacher characteristics, teachers per student, expenditures per student
"School Matters" - school inputs matter for test scores

Impact of Teachers

Traditional Approach - earnings function in labor economics:
$w = f$(compensating wage differential, skill measures, union)
Compensating Wage Differential - firms in different locations compete to attract workers; wages adjust so that some workers are indifferent between locations; adjust for...
Cost of Living - 10% higher cost of living, expect 10% higher wages
Climate - less desirable climate (too hot or too cold) requires higher wages
Risk - increased chance of death or injury requires higher wages
Skill Measures - firms willing to pay skilled workers more; measure skill by...
Years of Education - skills learned in school
Years of Experience - skills learned on the job
Union - union interferes with labor market and drives wage above market wage; significant for education because results in 95% of schools using salary scale where wages depend *only* on years education and experience
No Merit Pay - no incentive to be a better teacher
Applying to Schools -
(a) **Earnings Function** -
Years of Education - used to capture skills teachers learned in school
From "good" studies, DHK found 25% of teacher education coefficients were positive and significant
Problem - little variation in education among teachers; mostly due to large number of education courses taken ("Total time spent in school is usually correlated to taking a bunch of useless education courses")
Years Teaching - used to capture skills teachers learned on the job
From "good" studies, DHK found 52% of teacher experience coefficients were positive and significant
Problem - recent evidence suggests most of the gain for teachers comes in the first two years, then it benefit of experience levels off
(b) **Teacher Salary** - could pick up education and experience; assumes higher salary can attract better teachers
Problem - must control for compensating wage differentials and union premium
Teacher Test Scores - expect teacher with a high score in math will be a better math teacher
Strauss & Sawyer (*Economics of Education Review*, 1986) - used 145 NC districts; found higher average NTE test scores for teachers implied higher student test scores
Problem - only a few data sets have teacher test scores
Selectivity of College Attended - expect teacher from more selective (i.e., "better") college will be a better teacher
Ehrenberg & Brewer (*Economics of Education Review*, 1994) - used calculated average selectivity (based on *Barrons*) of college attended by high school's teachers; found student test scores rose as selectivity increased
Problem - want to match score to when the teacher attended the college because scores change over time

Alternative - use average SAT score for the college instead of the selectivity (JC)

Majoring in Field - expect a math major to be a better math teacher

Goldhaber & Brewer (*JHR*, Summer 1997) - found math scores are higher if the teacher has a BA or MA in math

"Teachers are wasting time taking all these dumb education courses"

Pay schedules ignore the opportunity cost of subject areas (can get better paying job outside of teaching)

Teacher Fixed Effects - use dummy variable for each teacher to capture teacher effectiveness; studies show there is variation in teacher quality

Hanushek (*Journal of Political Economy*, Feb 1992) - used fixed effects; R-squared increased by 1/3

"1 std dev below mean to 1 std dev above mean $\Rightarrow$ student test scores up 1 std dev (1 grade equiv)" (I'm not sure what that means)

Goldhaber & Brewer (JHR, Summer 1997) - using fixed effects raised R-squared from .77 to .89

Bonus - estimated teacher fixed effects can be basis for raises

Discussion Article

Southwick & Gill, "Unified Salary Schedule and Student SAT Scores: Adverse Effects of Adverse Selection in the Market for Secondary School Teachers," *Economics of Education Review*, 1997.

Unified Salary Schedule - pay is based solely on the years of schooling and teaching experience

Background -

Salary Changes from 1985 to 1991: (143)

Teachers - ↑5.5%/year

Math Oriented - ↑>6%/yaer (accounting, computer systems analysts, engineers)

Verbally Oriented - ↑4.5%/year (advertising, copyreaders, editors)

"Some writers argue that there will not be a shortfall in the *number* of teachers; the courses will be taught, although by less well-qualified teachers." (143)

Model -

Quality (capability) of teachers is function of teacher salary and the salary in alternative employment: $Q_i = f_i(S_T, S_i) \quad (i = M, E)$

$\frac{\partial Q_i}{\partial S_T} > 0$ (more teacher pay attracts better teachers)

$\frac{\partial Q_i}{\partial S_i} < 0$ (more pay for alternatives [higher opportunity cost] lowers teacher quality)

Student performance is function of teacher quality: $SAT_i = g_i(Q_i, \text{other inputs})$

SAT Scores - "While this is an imperfect measure, it is nationally uniform, and is used to monitor the performance of the secondary school system by policy makers and researchers." (144)

Two Models - assume Q_i and SAT_i are linear in logs:

(1) $\ln(SAT_i) = a_0 + a_1 \ln(S_T) + a_2 \ln(S_i)$ ... expect $a_1 > 0$ and $a_2 < 0$

(2) $\ln(SAT_i) = c_0 + c_1 \ln(S_i / S_T)$ ... expect $c_1 < 0$

(2) assumes: $a_2 = b_2$ (alternative pay affects teachers equally), $a_1 = b_1 = -a_2$ (it's only the differential salaries [opportunity cost] that is important)

Difference - theory really only talks about the relative effect so (2) gives just as much information to confirm the theory as (1), but (2) is better (according to Kenny) because it removes the compensating wage differentials (the authors for some reason like (1) better, but didn't say why)

Hypotheses Tested - in English: looking to see if higher wage differential ⇒ lower quality
Teacher salary ↑ ⇒ SAT scores↑
Alternative salary ↑ ⇒ SAT scores↓

Data - Annual SAT average values from each state and DC from 1985 to 1991 from *Digest of Education Statistics*
357 observations, but cut to 256 because some states use ACT instead of SAT

Alternative Wages - use *Occupational Outlook Quarterly* to get "average wages in industries that make heavy usage of mathematical or verbal skills at an education-level equivalent to that of a secondary school teacher, a bachelor's degree or higher" (145);
Specifics:

- Look at occupations that generally require four year degree
- Choose industries where these occupations are large proportion of total employees

Industries Chosen:

Math Oriented			Verbal Oriented		
SIC Code	**Industry Name**	**Employees (1000s)**	**SIC Code**	**Industry Name**	**Employees (1000s)**
8911	Engineering & architecture	742	7311	Advertising agencies	168
8721	Accounting, auditing & bookkeeping	537	7361	Employment agencies	265
			8641	Civic & social associations	427
7371	Computer programming	264	8111	Legal services	920
			4832	Radio broadcasting	121

Why Industry - "the data available was for the average state wage for the industry, not occupation" (145)

Problem - good technique for available data, but very judgmental; authors didn't cite cutoff for "large proportion"

% Taking SAT - expect better students to take the SAT so % taking ↑ ⇒ Scores ↓

Other - "to account for the possibility that there are systematic changes over time, we include dummy variables for each year. We also use the state per capita income as an explanatory variable, possibly proxying other resource at the disposal of the school system." (146); more variables:
Salary... measures teacher quality
Student/Teacher Ratio... measures teacher quantity
% Revenue Raised Locally... ??
Staff/Teacher Ratio... ?? (doesn't distinguish between support and administration)
Per Capita Income... BAD

Problems -

State Level - education is usually at a more local level; should use county or district level

Per Capita Income - DHK paper talked about how this is not good to include for education production function; could use average educational attainment in the state instead

Leave vs. Join - it's easier to leave teaching than to become a teacher (because of "stupid educational requirements")

Results -

"Higher alternative (nonteaching) wages for teachers of any subject (mathematics or verbally oriented) result in the relatively able people leaving or staying away form teaching" (143)

"There is a strong negative effect of the opportunity cost of teaching in a specialty on the performance of students in that area, evidenced by student scores in the SAT" (143)

Tiny Effects - 10%↑ in math salaries ⇒ 0.4%↓ in math SAT score... "with an average SAT score of 498, that decrease would be about two to three points" (**NOTE:** increments of SAT scores is 10 points)... Josh: this is not economically significant

Other Research - JC suggested looking at cost of unified pay (i.e., policy implications); what's the cost to improve the math scores vs. the verbal scores

Why finance PhDs get paid more the economics PhDs: "It's a compensating wage differential for spending your life reading boring questions."

Capitalization of Local Government Policies

Capitalization - interaction between housing market and local public goods; housing prices reflect the value (good or bad) of provision of public goods based on available information

Housing Market - assume house prices adjust so that in equilibrium some buyer is indifferent between houses

Hedonic Model - all else equal, expect higher housing price for better quality:

- Nicer House - bigger, more desirable features
- House closer to employment
- House next to lake, ocean or park
- House in neighborhood with less crime or pollution

Brueckner, "A Test for Allocative Efficiency in the Local Public Sector," *Journal of Public Economics*, Dec 1982 - showed that house value are related to the level of publicly provided goods

Insufficient Amount - if publicly provided good is underprovided, house values rise as more of the good is provided (e.g., if rich households are prohibited from funding their preferred level of G [as in FL with county-wide school districts], allowing them to have more G will raise property values

Optimal Amount - if publicly provided good is optimally provided, there is no reason for housing value to change as level of good changes (assuming property taxes are paying for the good... if level changes from other source [e.g., state grant], then housing values will rise)

Overprovision - house values fall as publicly provided good rises if good is overprovided

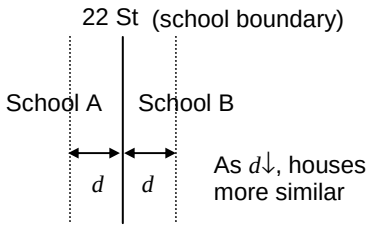
Romer & Rosenthal - bureaucracy can set low reversion level to get median voter to pass more spending than he wants; this will lower property values

School Quality on Housing Values

Black, "Do Better Schools Matter? Parental Valuation Of Elementary Education," *Quarterly Journal of Economics*, May 1999 - used school district borders to show that higher school test scores leads to higher house values

Concept - schools within certain distance of the district border should be in same neighborhood so other factors (year built, size, location, demographics, etc.) are controlled

Problem - some boundaries are big streets so neighborhoods on either side aren't comparable



Figlio & Lucas, "What's in a Grade? School Report Cards and the Housing Market," *American Economic Review*, Jun 2004 - actually use data on subdivisions (fixed problem in Black's paper)

Additional Information - looked at effect of additional information (grades assigned to schools by state) which goes beyond test scores, etc. that are already public to see if there is a further response in the housing market

School Grades - each school assigned letter grade (A, B, C, D, or F) based on

- Distribution of test scores
- Minimum % taking exam
- Absenteeism
- Improvement in test scores

Data - repeat sales of houses in 37 (of 67) counties; data from plated subdivisions in FL (usually less than 200 houses) from 1999 to 2001; only look at transactions in the months before and after letter grade assignment; 73,782 properties in 481 elementary school zones

Problem - F&L say grades have considerable measurement error and large variation from year to year (e.g., over half the schools had 2 different grades between 1999 and 2001)

Added Value - grades have little correlation with school's added value; grades only focus on outputs and don't account for inputs (poor schools want the system to account for background of students to adjust scores for what school has to work with)

South Carolina Example - (not in paper, but Kenny brought it up) each school is placed in a decile based on % of students who qualify for free or reduced lunch

Controls - control for platted subdivision and subdivision-year interactions

Results - when grades introduced in 1999: (t-stat)

A (relative to B) raises house price by 19.5% (1.52)
B (relative to C) raises house price by 15.6% (1.46)
A (relative to C) raises house price by 35.1% (2.88)

Third year of grades (1999-2001):

A (relative to B) raises house price by 8.7%% (1.64)
B (relative to C) raises house price by –2.2% (0.47)
A (relative to C) raises house price by 6.41% (1.42)

Consistent - looking at districts that maintained A in all three years, price was 10.2% higher than comparable houses (t = 2.04)

Useful Signal? the longer time period has smaller, less significant effects which confirms F&L's prediction that grades are too inconsistent to add additional value; evidence of low year-to-year correlation in grades ⇒ less weight placed on grades in housing market

Brasington, "What Measure of School Quality Does the Housing Market Value?" *Journal of Real Estate Research*, Nov/Dec1999 - examined which measure of school quality affect house prices

New Measures -

Relative pass rate (RPR) in i^{th} grade = school's pass rate – state pass rate
Value added in 9^{th} grade = RPR in 9^{th} grade – RPR in 4^{th} grade
Value added in 12^{th} grade = RPR in 12^{th} grade - RPR in 4^{th} grade

Problem - if you have to define a new measure, why would the market respond to something that's not immediately obvious, "If no one's aware of it, it's going to be hard for the housing market to reflect it"

Estimates - used separate hedonic regressions for 6 MSAs in Ohio looking at 37 different school quality measures for total of 222 regressions; did both OLS and spatial autoregressive regressions (so really did 444!)

Results - reports frequency of significantly positive (i.e., measure leads to higher housing values) and significantly negative coefficients for the school measures

	# sig pos / # sig neg
Attendance rate	7/0
Test score coefficients	5.23
Students/teacher (#neg/#pos)	4.00
Expenditure per student	3.00
Graduation rate	3.00
Teacher salary	2.33
Value added coefficients	1.23

Teacher experience	1.00
Teacher MA+	0.33

Pattern - if people aren't aware of the measures, the market won't respond
Problem - "nothing that comes out of any statistics book"; would be easier to interpret with a Fisher test (similar to Dewy, Husted & Kenny paper in previous set of notes)

Discussion Article
Brunner & Imazeki, "Tiebout Choice and the Voucher," working paper.
Contribution - look at rich vs. poor supporting universal voucher as function of Tiebout choice
Background -
Proposition 38 - statewide ballot initiative that would have provided families with a scholarship for every child enrolled in a private school; would have created the first universal voucher system in the US
"Our concern is not with the overall level of support for Proposition 38, but rather with how support for the initiative varies with the degree of Tiebout choice within educational markets" (6)
Peer Effects - assume students will benefit from more able classmates ∴ want to have lower ability benefit from higher ability students... which of course ignores the needs of the high ability kids (Len's cynical editorial)
Tracking - opposing theory to peer effects; put students in tracts (e.g., high, medium, and low ability); targets teaching to homogeneous group of students
Income - B&I assume income is proxy for student (hence peer) quality
Parent Education - B&I also use parent's education instead of income (get even stronger results)
Tradeoff - peer quality vs. housing values
High sorting (high choice market) ⇒ voucher subsidizes poor
Poor choose private school to get better peer group; rich move to poor jurisdictions to avoid higher taxes which raises poor property values
Rich lose advantage of high spending educational jurisdiction; property values fall
Low sorting (no choice, one district market) ⇒ voucher enables sorting
Rich can choose higher peer group
Poor end up with worse peer group in public schools

High Choice
Poor peer group ↑
housing ↑
Rich housing ↓

Low Choice
Poor peer group ↓
Rich peer group ↑
(no capitalization)

Model -
J equally sized jurisdictions, 1 school per jurisdiction
N households ($N >> J$), each with exactly 1 child
p is housing price; all housing within jurisdiction are homogeneous
y is household income, continuous distribution $F(y)$
Household preferences defined over composite goods ($x = y - p$) and child's educational achievement (a)
Student achievement depends on student's own ability (b) and mean ability of child's peer group ($\bar{b}$)
Student's own ability is function of households income (y)
Summary - $b = \gamma_1 y$ and $\bar{b} = \gamma_2 \bar{y}$ ⇒ $a_{ij} = \gamma_1 y_{ij} + \gamma_2 \bar{y}_j$ (kid i in jurisdiction j)

Data - Block group-level data on fraction of voters that support the initiate and their characteristics obtained from Statewide Database (Institute of Governmental Studies at UC Berkeley)... 80 dropped from missing vote data and 111 dropped from missing Census data for total of 21,942 groups

Weighted - teach block weighted by total number of voters in the block

Metro Areas - 46 counties located in one of 36 metropolitan (>50K) or micropolitan (>10K); remaining 12 counties treated as separate markets

Tiebout Choice - use Herfindahl index of total K-8 enrollment in district (l) in metro area (k) as share of total K-8 metro enrollment; 0 $\Rightarrow$ 1 district; $C_k \uparrow \Rightarrow$ more choice

$$C_k = 1 - \sum_{l=1}^{L} e_{lk}^2$$

Income - defined "rich" block if block's median income is ≥ 130% median income of metro area; "poor" bock if block's median income is ≤70% median income of metro area; results in 31% rich blocks and 20% poor blocks

Sensitivity - use mean and different cutoffs (140, 150; 60, 50)

Other Variables - metro area population, metro area population density, Gini index of household income, index of racial heterogeneity, index of educational heterogeneity

Problem - endogeneity; many of these are determinants of Tiebout choice and number of jurisdictions

Results -

"In markets with little or no Tiebout choice, changes in peer quality create an incentive for high-income households to vote in favor of the voucher and for low-income households to vote against voucher. In contrast, in markets with significant Tiebout choice, changes in housing values create an incentive for high-income households to vote against the voucher and for low-income to vote in favor of the voucher" (1)

Predicted % of "Yes" Votes on Proposition 38

	Choice = 0	Choice = 1
Low-Income	24.6	29.2
High-Income	33.1	28.2

Translation - theory is supported; not only are signs of coefficients significant and positive, the change in magnitudes are correct (i.e., poor support less with low choice and rich support less with high choice), and even the overall support (at least for point estimates) are correct (i.e., with no choice, rich prefer vouchers more than poor and with choice, poor support vouchers more than rich)

Robust - Table 5 looked are different definitions of Tiebout sorting (education, race); Table 6 replaced income with fraction college and fraction white (even stronger results)

Problem - used unobserved extremes for prediction (e.g., fraction college = 0 or 1... probably don't have those extremes in the data); would be better to use min and max observed ("the numbers get a little goofy")

% Republican - "we include this variable to control for the fact that school vouchers are the mainstay of conservative political ideology" (8) (favor competition, less government, more privatization)

Result - + and significant

% Educational Employees - "fraction of employed persons sixteen years or older who work in educational services... we include this variable because public school teachers and teacher unions are often vocal opponents of the voucher" (8)

Result - – and significant

Problem - includes private school teachers and university faculty

Other Problems -

- Rural counties (likely to be single jurisdictions, i.e., no choice) may not have private schools available
- Fraction of rich vs. poor (31% and 20%) are pretty large
- Doesn't address schooling of illegal immigrants
- Table 2... used logistic specification, not a logit

Inefficiencies in Government

School Choice Debate - 2 views from proponent (opponent's argue exact opposite)

(A) Escape Poor Schools - basic idea is that choice allows students to move to better schools

Types of Choice -

Vouchers - vouches facilitate use of private schools; without the voucher, parents are paying twice for the same service

Private More Efficient - arguments why they are:

- Fewer regulations
- Less likely to be unionized; unions impose work rules and limit merit pay
- Principal-agent mechanism is more effective; fewer owners (principal's) in a private school; for public schools, all the voters have a stake (including those without kids in the system); with more owners there's less incentive for each principal to check on the agent

Charter Schools - publicly funded, but considered better than traditional public schools

- Fewer regulations (e.g., don't need certified teachers, more freedom in devising curriculum)

"There's a common belief that a lot of what's involved in teacher certification is a waste of everyone's time."

Magnet Schools - public schools that offer special programs available to students in the entire district (e.g., international baccalaureate or arts programs); IB is competition for traditional advanced placement (AP) classes at normal public schools

District Choice - students allowed to choose among all public schools in a district (e.g., Alachua county allows this as long as the school chosen is not over-crowded)

Hypotheses Tested - focus on whether one institution is better than another (i.e., are the schools that add more choice better than traditional public schools)

- Do voucher students learn more in private schools?
- Do charter students learn more in charter schools?
- Do kids who switch public schools learn more in new schools?

(B) Improve <u>All</u> Schools - school choice produces more competition which makes all schools more efficient

Types of Competition -

More Districts - more competition among districts

Vouchers - more public-private competition

Charter, Margent & District Choice - more competition between districts' schools

Hypotheses Tested - focus on students "left behind" in traditional public schools; basic question is: "Do public school students learn more with...

- more public school districts
- availability of private school vouchers
- more magnet schools
- more charter schools
- intra-district public school choice

Competition Among Governments

Efficiency - competition is expected to make each government more efficient:

- **Comparison** - having something to compare the government to; more information available means inefficiencies are more evident
- **Leverage** - more governments gives residents (parents) more leverage (can leave if another government is more efficient)
- **Homogeneous** - Tiebout sorting says if there are more districts, the districts will be more homogeneous... easier to serve similar residents?

Discussion Article

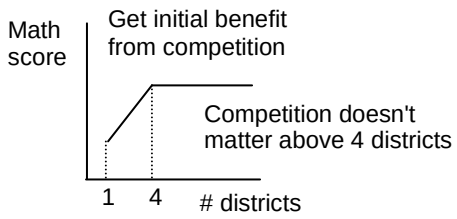
Zanzig, "Measuring the Impact of Competition in Local Government Education Markets on the Cognitive Achievement of Students," *Economics of Education Review*, Oct 1997.

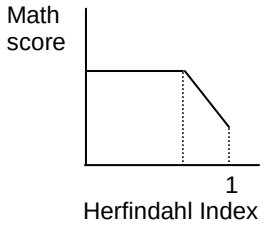
Background -

- "From 1967 to 1992, Scholastic Aptitude Test (SAT) scores have steadily declined, dropping more than 50 total points. During this time, real expenditures per pupil have more than doubled" (431)
- "Largely ignored in the education reform debate has been a discussion of what incentives exist for educators and policy-makers to use their resources to improve student performance" (431)
- "As the educational environment becomes more competitive, and thus monitoring becomes cheaper, a greater constituency emphasizing cognitive achievement will exist" (431)
- "As additional districts are added, comparison between districts become easier, resulting in more effective parental monitoring and thus higher achievement scores. At some point, the benefit of additional districts becomes negligible and the introduction of additional school districts has no effect on student performance" (432)
- Breshnahan & Reiss (1991) - find in retail and professional service markets 3 to 5 firms were all that was necessary to create a fully competitive market
- Borland & Howsen (1993) - used Herfindahl index for market concentration; "in districts above the 0.5 critical level of concentration, student achievement scores were 3% lower than in the completely competitive districts" (432)

Model - using a production function approach

- **Dependent Variable** - SCHOLARSHIP; district mean scores on arithmetic section of California statewide mandated test for twelfth grade students during 1970-1971 school year (*Iowa Tests of Educational Development* (ITED), Form X-4, Class Period Version); score is out of 33 points (Average = 12.776; StDev = 1.991)
  - **Benefit** - mandatory tests so don't have problems of voluntary tests like the SAT
- **Measure of Competition** - use two approaches; both use a **spline** which allows the slope to vary (initial improvement up to a threshold at which point more competition doesn't improve performance); in both cases, the threshold level was found by using different values and selecting the one that gave the best fit;
  - **# Districts** - call the threshold M
    - **DISTRICT 1-M** - number of districts in county if it's ≤ M; M otherwise; expect this to have positive effect (more competition)
    - **DISTRICT M+** - MAX {number of districts in county minus M, zero}; expect this to have no effect
  - **Threshold** - 4 for 2SLS; 4 for OLS





Herfindahl Index - sum of squared district student population shares for each county
- **HERFINDAHL N+** - range from critical value to 1; corresponds to DISTRICT 1-M; expect negative effect
- **HERFINDAHL 0-N** - region of complete competition; corresponds to DISTRICT M+; expect no effect
- **Threshold** - $1/0.58 \approx 2$ for 2SLS; $1/0.28 \approx 4$ for OLS

Two-Stage Regression - have possible endogeneity with teacher salary
- **Instruments** - two unique variables (poverty, non-teaching) and other variables from second state (FEMALE EDU, DENSITY)
  - **FEMALE EDU** - more educated population has higher value on education; expect +
  - **POP DENSITY** - reflect cost of living; expect +
  - **POVERTY** - (lack of) wealth of community; expect –
  - **NON-TEACHING** - schools that can high large percentage of non-teaching personnel are able to higher better teachers; expect +
- **% Union** - didn't use this measure; could be because it's hard to get the data or because there's not enough variation in the data; didn't even mention unions in the paper

Data - district level data; excluded districts with incomplete information... 337 observations

Results -

"Achievement scores are found to rise as the local education market becomes more competition... three to four school districts per county are necessary to create a competitive market in education." (431)

Competition - DISTRICT 1-M, DISTRICT M+, HERFINDAHL N+ & HERFINDAHL 0-N have the predicted signs and are significant

Educational Inputs - 3 categories:

(1) Parental Inputs

Measure	Predict	Result
FEMALE EDU - countywide percentage of females over 25 years old who have completed at least 4 years of college; "more educated parents should be more effective in passing on knowledge to their children" (433)	+	+ & signif
MINORITY - percentage of minority students in a particular district; "those for whom English is a second language may not perform as well in English based tests" (433)	–	– & signif

(2) Student (own & peer) Inputs

Measure	Predict	Result
ATTENDANCE - ratio of average daily attendance to the total enrollment (x100) for grades 9-12 for each district; "student time devoted to learning plays a significant, positive role in cognitive achievement" (433)	+	+ & signif
PRIVATE - percentage of students attending private schools in a county; "public school districts in that county will be left with worse students and thus have lower achievement scores" (433)	–	– & signif

(3) School or Policy Inputs

Measure	Predict	Result
SALARY MED - median teacher salary; "will be treated as endogenous and the model will be estimated using an instrumental variables procedure"; "school districts with	+	+ & signif

higher median salary, ideally, have better teachers" (433)		
SALARY H/M - ratio of maximum teacher salary to median teacher salary; "As the gap widens, a greater incentive exists for teachers to improve their skills, thus pulling up student performance scores" (433)	+	+ & signif
POP DENSITY - county population density; "facilitate taking advantage of scale economies in schools, leading to higher achievement" (433)	+	+ & signif

Hoxby, "Does Competition Among Public Schools Benefit Students and Taxpayers?" *American Economic Review*, Dec 2000 - covered in "Determination of Number of Governments" notes

Model - using a demand approach (can tell because she used household income and didn't use anything to capture student inputs)

Table 3 - test scores as function of...
- Index of Choice - 1 – Herfindahl Index
- Parent Education
- Female, Black, Asian, Hispanic
- Metro Area
- Household Income

Choice Variable - since it's a demand function, view choice variable as "price of achievement"; more schools ⇒ more efficient (lower price)... expect higher test scores

Discussion Article

Booker, Gilpartic, Gronberg & Jansen, "The Effect of Charter Competition on Traditional public School Students in Texas," working paper.

Background -
- "We test for a competitive effect of charters by looking for changes in student achievement in traditional public schools following charter market penetration" (abstract)
- **Argument For Charters** - "an important claim which distinguish choice reform from most within-institution reforms is the possibility of increasing educational outcomes for all students without increasing the allocation of resources to the educational sector" (1)
- **Argument Against Charters** - "the ability distribution of students may be altered by the exit of some of the highest and/or lowest ability kids" (1)
- **Charter School** - basically a public school with "greater degrees of freedom in dealing with certain regulations" (2) (e.g., except from teacher certification and minimum salary requirements; greater freedom in devising curriculum)
  - **Expansion** -
    - **US** - 1994-95 had 100 charters enrolling 25K students in US; 2001-02 had 2,700 charters with over 500K students
    - **Texas** - 1996-97 had 16 charters with 2,412 students; 2001-02 had 179 charters with 47K students (1.1% of total public school enrollment in state)
  - **Why Charters** - better as gauge of competition than private school because charters offer a differentiated product at the same zero tuition as public schools
    - **Tiebout Competition** - high transaction costs (have to move)
    - **Private Schools** - charge tuition
  - **Why Texas** - prior to 2001-02, "Texas school financing rules transfer one hundred percent of the maintenance and operation formula support... from the child's home district to the charter school. The local district revenue implications of losing a student to a charter are thus larger in Texas then in either Michigan or Arizona" (4)

- **Rules** - rules for establishing charters in Texas varied during course of study; between 1998 and 2000, charters were not capped only if they served at lease 75% academically "at-risk" students; condition dropped prior to 2000-01 school year
- **Location** - charters in 41 of 254 counties; > 60% in five largest metro areas (Houston, Dallas-Fort Worth, El Paso, San Antonio, & Austin)... 47% of population of Texas; charters in 67 of 1041 school districts (later changes to 56)... these 67 districts account for 42% of public school enrollment in Texas

Model -

- **Competition** - 3 views
  - **Pure Contestability** - "potential for charter school entry... is key. School districts might respond to the threat of competition without a single charter ever forming" (6)
  - **Modified Contestability** - "it is the presence of established charters that creates a meaningful competitive threat" (6)
  - **Realized Loss** - "charter school competition may be measured by the realized loss of students (reduced market share) to charters, rather than by the potential for such loss" (6); this is used by authors: "it counts not the number of charter schools regardless of size but instead counts the number of students that charters have successfully attracted away from traditional public schools" (7)
- **Level of Competition** - authors looked at two measures to determine level of competition
  - **District Penetration Measure** - "percent of public school students in a district that attend a charter school, relative to total (traditional public plus charter) public school enrollment in a district" (7-8); "advantage of focusing on the impact of charters at the administrative level where fiscal decisions are made" (8)
  - **Campus Penetration Measure** - mimics district; "net flows of students to charters for each campus" (8)
  - **Alternative** - Prof. Kenny suggests going up too: using metro area penetration
- **Controls** - control for student background by...
  - **Campus Fixed Effects** - indirectly control for observed student and student family background characteristics; more importantly, Prof. Kenny says this could potentially solve most of the endogeneity problems making the IV unnecessary
  - **Student Fixed Effects** - directly control for student and student family background
  - **Both** - include all fixed effects
- **Which to Use** - in empirical tradition, use all combinations and pick the best fit
- **Instruments** - account for endogeneity of school losses to charter schools; "The degree of charter penetration that a district faces is not random, and may depend on the average performance of students in the district.... This endogeneity of charger school location could bias estimates of the effect of charter penetration on student performance" (15)
  - **Solution** - "We use the lagged value of the district's charter penetration measure, and the district's lagged passing rate on the TAAS test, as instruments for the district's charter penetration" (15)
  - **Problem** - these also aren't random; "uninspired choice to deal with endogeneity"; besides, the campus fixed effects should handle this

Data - all data from Texas Education Agency (TEA); campus & student level observations

- **Students** - all students in grades 3 through 8 from 1995 to 2002; these are the grades where Texas Assessment of Academic Skills test (TAAS); used math portion
- **TLI Score** - TEA transforms TAAS scores to Texas Learning Index (TLI) "which allows comparisons across school years and grades, and allows for evaluation of student progress" (10); assigns 40th percentile to TLI score 70 and 15 TLI points = 1 standard deviation; "TLI scores thus have a norm-referenced character" (11)
- **Dependent Variable** - change in TLI score for each student; "value-added measure of student performance" (12)

Samples - "randomly selected sample--usually one-third--of the population of student observations. This is done for computationally tractability" (13)... according to Table 6, there are over 2.7 million observations

Results -

"We find a positive and significant effect of charter school penetration on traditional public school student outcomes" (abstract)

Effect - coefficient of 0.14 on district charter penetration; 1 %-point increase in charter penetration ⇒ math TLI gain of an average of 0.14 for students in that district; districts facing 5% penetration (Dallas & Houston in 2001-02), average student math TLI gain would be 0.72 higher than if they faced no charter penetration; average TLI is 83.8 with StDev of 3.09 so the 0.72 gain is 0.23 standard deviations

Student Characteristics - % by ethnicity, limited English proficiency, disadvantage status, enrollment in special education

Tables 6 & 7 - black, female, Hispanic, limited English all have bigger gains, "not exactly intuitive"... could be a problem there

Tables 9 & 10 - charter penetration is + and significant for quintiles 1 & 2, but – and significant for quintile 5; "makes me a little nervous"

Len's Cynical View - test scores are reverting back to average

Overall Problem - Nick pointed out that authors are using a dependent variable that measures the change in test scores, but all the independent variables are static

Discussion Article "When I first looked at this paper I was really excited"

Sandstrom & Bergstrom, "School Vouchers in Practice: Competition Will Not Hurt You," *Journal of Public Economics*, 89 (2005).

Background -

Why Sweden - complete reform of school financing in the 1990s; centralized system replaced by vouchers and parental choice; under reform ALL schools (municipal and independent [private]) receive public financing on "close to equal" terms; only limitations to schools:

- "Must pledge not to charge an additional tuition fee"
- "Cannot refuse to accept low ability students" (352)

Close to Equal - independent school gets 85% of municipality's costs per student

Compulsory Schooling - age 7 to 15; tops out at 9th grade

Approval - independent schools must be approved by the National Agency for Education; municipality can oppose the independent school, but "have no veto, and are bound by law to finance an independent school once it has been approved" (356)

"Of obvious interest is if the achievements of students in independent schools differ from those of students in publicly run schools." (352)

Coleman et al (1982) - evidence that private schooling was more effective

Rouse (1998) & Greene et al (1999) - evidence that students who attend private schools (under Milwaukee voucher program) score higher on some achievement tests than students in public schools

Howell et al (2002) - randomized field trial in three US cities found black students who attended private schools had better test scores then their public school peers (didn't hold for other ethnic groups)

"We will focus on another issue, namely what effect competition from independent schools has on the public schools" (353)... three **measures of achievement** (first 3 look at average results, but last addresses critique "even if freedom of choice improves the

average results of students, it may still be undesirable if a considerable number are 'left behind'":

Credit Score - "calculated form the student's final grades in his 16 'best' subjects, and constitutes the basis for acceptance to high school" (360); roughly equivalent to GPA, but is not objective ("we used the results form the mathematics tests to test whether competition from independent schools inflated the grades of students. No such effect was found" (361))

Math A Score - 2 of 5 sub-test in standardized national achievement test in mathematics; "these tests are compulsory, and identical throughout the country; sub test A "tests the students' ability to comprehend mathematical symbols and expressions" (361)

Math B Score - "consists of short algebraic problems"

Passing - dummy variable indicating whether student passed all three cardinal subjects (mathematics, Swedish, and English); "a measure of student achievement that will only improve if the results of low-ability students improve" (361)

Cross-Section -

Problem - most of the paper is on the cross-section when the interesting part (i.e., change in regulation) requires panel data to determine the effect of the change (and the panel they use doesn't address the question of whether competition makes public schools more efficient)

Panel Data - 288 municipalities; average grades from 5 years

Model -

"Because the decision on which school to attend is a choice variable, sample selection models are used" (351)

Identification Problems -

Sample Selection - "we use sample selection models in order to simultaneously model both the students' choice of school and their educational results. This approach is used to take account of the fact that students choosing public schools are not a random sample of all students" (354)

Endogeneity Problem - "the number of students attending private schools, may be endogenously determined. If public schools are of poor quality, the demand for private schools may be larger"; S&S talk about Dee (1998), Hoxby (1994), Couch et al (1993) who use instrumental variables to account for this

Independent School Share - "key explanatory variable should be a gauge of the degree of competition from independent schools... we use the share of students attending independent schools in each 'market'" (357) (market = municipality)

IV Regression - independent school share has the endogeneity problem so S&S use IV; first state includes:

Municipality Attitude - could encourage or discourage private schools

Contracting - "extent to which municipalities contract out their responsibility is an indicator of their attitude to the 'privatization' of public sector activities" (359); used 5 areas: infrastructure (roads), child care, care for elderly & disabled, social services (drug treatment), and "business activities" (expect +)

Problem - these could be highly correlated to each other; may be better to use index of the overall level of contracting

School Quality - reforms passed in 1992 so "it seems safe to assume that the grades given in that year have not been affected by any change in the degree of competition from independent schools" (359) (expect –)

NAE Recommendation - "we based the decision on which other variables to include in Eq. (2) partly on information from the National Agency for Education" (359)

Share of Immigrants - "some independent schools have a special focus on minority groups" (359); (expect +)

Share with no Higher Education - "parents of students in independent schools on average have higher incomes and higher educations" (359); (expect –)

Average Income in Municipality - (expect +)

Economies of Scale - authors didn't call it this

Urban - dummy variable indicating whether municipality is in a major urban area

Population Distance - "the hypothetical average distance between inhabitants in the municipality under the assumption that they are evenly distributed" (359); this is a measure of population density; (expect ?) "It is not obvious what signs the coefficients of these variables should have" (359)

Problem - why use both of these; they're measuring the same thing

School Resources - use average cost per student; "Strictly, this variable may also be endogenous, but we will ignore this complication"; unclear sign; city spending a lot could have low demand for independent school, but it could also be easier to start an independent school because they get 85% of the cost

Political Variables - "political views of the inhabitants of a municipality may affect the demand for independent schools" (360)

Non-Socialist Vote - share of votes received by non-socialist parties in 1998 general election (expect +)

Non-Socialist Government - dummy indicating if municipal government is non-socialist (expect +)

Problem - these are probably highly correlated; given weird signs in results, would probably be better to use interaction term (e.g., high non-socialist vote with non-socialist government are probably happy with public school; high non-socialist vote with socialist government are probably not happy and more likely to have private schools)

Problem - explanatory power of 1st stage is pretty low ($R^2 = 0.11$)

Heckman Approach - another method for dealing with the endogeneity of independent school share

Other Explanatory Variables - used in second stage; everything from first stage except political variables are included; "other explanatory variables were included partly based on research by the National Agency for Education. The Agency's investigations indicate that the student's sex (female = 1), immigrant background, parents' educational level and income, and the number of students at the school influence students results." (361)

Female - (expect +)

Income - don't have family income so use municipal average (same as 1st stage)

School Cost - "we also include a school spending variable which is defined as municipal spending per student excluding rental costs" (362)

Problem - highly correlated with income; should use real measure of school quality (teacher education, class size, etc.)

 # Students -

Problem - captures same thing as population distance and urban (which are already highly correlated to each other!)

No Religion - not included because strong homogeneity among population (almost all Lutheran), schools "may not based admission on ability or on religious or ethnic origin" (356)... but "Muslim and Jewish schools have been approved, as well as Christian schools of various denominations" (357)

"It is likely that the error terms are more closely correlated for individuals attending the same school than for individuals in different schools. To allow for this, we estimate robust

standard errors, allowing for a cluster effect, using the procedure suggested by Rogers (1993)" (362)

Data - 4 sets

Data on 28,000 Youths - National Agency for Education; socio-economic variables, grades and results on national achievement tests for all students in ninth grade in 34 Swedish municipalities for 1997-98 school year

Data on Public Schools - type of school, number of students, etc.

Data on Municipalities - population distance, average income, costs for compulsory school per student, etc.

Data Problems -

- Lots of missing observations (results in losing an entire municipality so really have 33); "It is not likely that the missing observations are random" (363)
- 26,656 students in municipal school; only 1409 in independent schools

Panel Data - data for 1992, 1994-1997 for all 288 municipalities that existed in 1997

Dependent Variable - average grade of all students

Problem - doesn't allow you to tell how students who remain in public school do

Example - supposed private school is better than public school; all tests in private school are 30 points and in public school are 20; as %private increases, average test scores increase, but students in public school aren't better off

"The table shouldn't even be printed"

Results -

4 Regressions - (I) is OLS, (II) is OLS with Heckman, (III) is 2SLS, (IV) is 2SLS with Heckman

Independent School Share - + and significant in all 4 regressions ∴ "competition improves the quality of public schooling" (369)

"Our finding support the hypothesis that school results in public schools improve due to competition" (351)

"We find that the extent of competition from independent schools, measured as the proportion of students in the municipality that go to independent schools, improves both the scores on a national standardized mathematics test and the grades in public schools" (355)

"There is no indication that the expansion of independent schools has increased total expenditures on schools" (355)

Principal-Agent Problem in Government

How effective is the principal (voter) at monitoring and punishing the agent (government)

Filer, Kenny & Morton, "Redistribution, Income, and Voting," *American Journal of Political Science*, Feb 1993.

Voter Information and Participation

Principal-Agent Mechanism - efficiency of government reflects delicate interaction between

Principal - citizens

Agent - government

Requirements - to function effectively, governments that perform poorly must be punished, this requires:

- **Knowledge** - citizens need to know about poor performance; need availability of information and ability to understand the information
- **Participation** - citizens need to participate to ring about punishment

Problem - benefit from political participation is very low

Simple Model of Voting - use dollar equivalents and assume citizens are risk neutral

Political Income - citizen i makes voting decision based on change in his income from candidates policies

$M^*_{A,i} = M_i +$ value of G received under candidate A – taxes under candidate A

$M^*_{B,i}$ similarly defined

Expected Income When Not Voting - $EM^*_{nv,i} = p_A M^*_{A,i} + (1 - p_A) M^*_{B,i}$

$p_A =$ probability that A wins if citizen i does not vote

Effect of Voting - alters probability that candidate A wins by Δp_A

If $M^*_{A,i} > M^*_{B,i}$, citizen i votes for A $\Rightarrow$ $\Delta p_A > 0$

If $M^*_{A,i} < M^*_{B,i}$, citizen i votes for B $\Rightarrow$ $\Delta p_A < 0$

Cost of Voting - C; accounts for

- Value of time spent learning about candidate
- Value of time spend physically voting
- Out of pocket expenses (travel cost, poll tax)
  (Some countries have inverse poll tax; Australia charges $25 if you don't vote)

Expected Income When Voting - modify probabilities and subtract cost:

$EM^*_{v,i} = (p_A + \Delta p_A) M^*_{A,i} + (1 - p_A - \Delta p_A) M^*_{B,i} - C$

When to Vote - citizen i will vote if

$EM^*_{v,i} > EM^*_{nv,i}$

$(p_A + \Delta p_A) M^*_{A,i} + (1 - p_A - \Delta p_A) M^*_{B,i} - C > p_A M^*_{A,i} + (1 - p_A) M^*_{B,i}$

$\Delta p_A (M^*_{A,i} - M^*_{B,i}) > C$

i.e., vote if expected benefit exceeds cost

Impact of Δp_A - $\Delta p_A \uparrow \Rightarrow$ benefit from voting rises so more likely to exceed cost (i.e., should be more likely to vote); **problem**: usually Δp_A is very small; factors:

Close Race - impact should be grater if close race is expected (e.g., if predicting a landslide, people are less likely to vote)

Evidence - many studies find turnout is greater in races where results were actually closer; (didn't always have polls prior to elections; could use them, but that limits the sample to more recent elections)

Community Size - voters in large community less likely to affect race ∴ turnout should fall as population rises

Evidence -

Filer & Kenny (*Public Choice*, 1980) - show turnout in city-county consolidation elections falls as population of city or county rises

Lott & Kenny (JPE, 1999) & Nalebuff (AER 1999) - find turnout lower in larger states

Stake in Outcome - $\left|M^*_{\mathrm{A},i} - M^*_{\mathrm{B},i}\right| \uparrow \Rightarrow$ more likely that benefit > cost; factors:

Items on Ballot - more items on ballot leads to higher turnout (e.g., additional races for president, senator, or governor... governor is higher than senator because there's only 1 governor whereas senator is 1 of 100)

Bonds - if bonds on ballot are larger share of budget there's higher turnout

Budget - larger budget has higher turnout

Income - more poor or more rich have larger stake in redistribution so turnout is higher

Home Owners - potential capital gains/losses increase turnout

Fischell, *The Homevoter Hypothesis* - book argues homeowners are active participants in protecting values of their homes

Examples -

Alachua county election to establish new library district; turnout abysmal, but lots of librarians showed up to vote

Gainesville has election in March for city commission; turn out is very low

Cost of Voting - $C \uparrow \Rightarrow$ less likely that benefits exceed cost (i.e., lower turnout); factors:

Time - time cost of voting = wage·(time spend on voting)

Wage - higher wage increases time costs; some evidence this leads to lower turnout

Population Density - lower density has higher time cost (polls further away); turnout lower in sparsely populated areas

Information - lowers time cost of voting

Referenda - voters usually less informed because they're complicated and not repeated

Filer & Kenny - find turnout 0.40 lower for referenda item than for candidate (very significant because average turnout is 0.55)

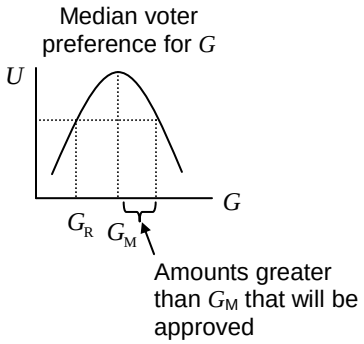
Wording - $3 billion vs. "you pay $50 per year"... latter is more easily understood; FL requires amendments to include cost information but doesn't' specify how (this is result of Democrats trying to avoid putting down cost of class size amendment)

Age - skills increase and better able to pick candidate

Education - helps cope with dynamic environment

Evidence - turnout rises as education and age rise

Different Argument - age could be capturing changing dependence on government (stake) rather than cost of voting (e.g., progress through life, buy house [capital concerns], have kids [education issues], retirement [social security])



Holcombe & Kenny - study voting on Florida referenda on school budgets

Unique System - between 1947 and 1968, FL system was unique:

- School board recommends a millage rate
- Voters approve or write in preferred rate (other states just have yes/no decision)
- If proposal doesn't get majority, median rate wins

Benefit - unique system avoid power agenda setting by school board (e.g., can set very low reversion level to get median voter to approve higher budget

Result -

Education - counties with higher education have greater dispersion of preferred tax rates... citizens less likely to defer to school board's recommendation because they can do their own evaluation of how much is needed

County Size - also true for smaller counties... greater incentive (vote counts more) and easier to acquire knowledge on smaller school district

Husted, Kenny & Morton, "Constituent Errors in Assessing Their Senators," *Public Choice*, 1995.

Contribution - explain the accuracy of voters in assessing the position of their senator

Background -

Electoral Threat - only valid if electorate is well informed about legislator's behavior in office

Validity - "Individual voter has little incentive to vote, much less to study the political options, since she is unlikely to be a swing voter" (252)

Literature -

Converse (1970) - said errors are largely due to lack of political sophistication

Achen (1975) & Erikson (1979) - suggest apparent error may be a result of vagueness of the questionnaire

Palfrey & Poole (1987) - constructed index of voter information using estimates of the true positions of candidates and parties; "voters with more extreme positions on the issues were more likely to have accurate information on the true positions of the candidates and parties"; "informed voters are much more likely to vote and their voting decision is more predictable" (253)

Powell (1989) - "found that contributors to political campaigns are more accurate in specifying the true positions of candidates than other constituents who are less involved" (253)

Model -

Bayesian Framework - learning procedure through which voters update their evaluation of candidates with new information

Uninformed Voter - assigns senator some average liberal score (PRIOR in class notes; GENERAL in paper); 3 measures of average:

- Average for all senators
- Average for party
- Average for party in the region

Best Fit - found best fit from average of all senators (i.e., uninformed voters don't even consider party!)

Acquire Information - didn't cover in class, but paper says information is acquired by signals which can be "truthful" (normally distributed with mean ACTUAL) or "false" (normally distributed with mean GENERAL)

Prediction - as voter gets more information, PREDICT moves from PRIOR (GENERAL) to ACTUAL

PREDICT = $\alpha \cdot$ACTUAL + $(1-\alpha) \cdot$PRIOR

where $\alpha\uparrow$ as information increases; from paper: it's a function of the number of truthful and false signals about the politician's position that have been received by the voter

Error - ERROR = ACTUAL – PREDICT

Sub in formula for PREDICT: ERROR = $(1-\alpha)$(ACTUAL – PREDICT)

Use absolute values: $|\text{ERROR}| = (1-\alpha) \cdot |\text{ACTUAL} - \text{PREDICT}|$

Implications -

- Voters with more information (high α) have smaller errors
- |ACTUAL – PREDICT| $\Rightarrow$ expect larger errors in assessing atypical (i.e., more extreme) politicians

Participation - inversely related to cost; several factors: Predict

- Income - time cost of voting –
- Age - measure of capability & experience –
- Population density - closeness of polls –
- Length of residence - knowledge of local affairs –
- Union & married - "miscellaneous indicators of shared knowledge" ?
- Education - Schultz (1975) "raises skills and... allocative abilities" –

Data - 1982 American National Election Study (ANES); nationally representative pre- and post-election survey of 1418 adults

Self Report - respondents asked to place themselves on liberal-conservative scale (1 to 7); 471 "hadn't thought much" about it... not used in this study

Missing Data - only 790 adults from 36 states evaluated at least one senator, but 149 deleted because of missing socioeconomic data

Total - 1130 predictions (489 on both senators, 152 on single senator)

Swap Scale - reverse scale so 1 is "extremely conservative" and 7 is "extremely liberal'

Modified ADA - range from 0 (most conservative) to 100 (most liberal), but counts missing vote as vote for conservatism ∴ modified ADA scores to ignore missing votes (e.g., Edward Kennedy missed 12 of 18 votes in 1980 so he has a conservative score of 33, but for the votes he did make he had a score of 100 [extremely liberal])

Match Range - scale modified ADA score to match the discrete 1-7 scale from ANES data; use narrower range 2-6 first (range some specifications with 1-7 scale)

Ordered Probit - used because dependent variable is discrete

Results -

Smaller Errors - older, more educated, white, male, home owner, tenure

Insignificant - union, married

Atypical Senators - larger errors (as predicted); positive & significant coefficients on DIFFALL, DIFFPAR, and DIFFREG ("absolute values of difference between Senator's transformed average 1981, 1982 ADA ratings (TADA), measuring ACTUAL, and each of the three proposed measures of GENERAL" (261))

Effect of Number of Voters

Small Jurisdiction - more likely to affect outcome so there's stronger incentive to participate politically

Evidence -

- Voter turnout higher in small jurisdictions
- PTA involvement greater in small school (McMillan)

Predictions - in smaller jurisdiction...

- Greater political participation
- More effective public monitoring
- Publicly provided service relatively cheaper

Koh, Berg & Kenny (*Land Econ* Feb 1996) - found public electrical production is cheaper than private production at low output, but more costly at high output

Equal Input Prices - public is cheaper if Q < 58,516 MWh

Evidence - 7 of 182 firms have Q < 58K; of the 7, 6 are public

Different Input Prices - more realistic to account for interest free municipal bonds (i.e., lower input prices for public utilities)... example: if person is in 25% tax bracket, an 8% taxable bond is equivalent to a 6% tax-free bond (25% savings in input cost to public utility).... now public is cheaper if Q < 725,106 MWh

Evidence -

	Q < 725K	Q > 725K
Public	42	19
Private	12	109

Cross terms, 12 + 19 = 31 firms are in the costlier setting (i.e., public over 725K or private under 725K)

Husted & Kenny, "Evidence on the Impact of State Government on Primary and Secondary Education and the Equity-Efficiency Trade-Off," *Journal of Law and Economics*, Apr 2000.

Contribution - examine impact of state government on school performance... looking at both efficiency (test score average) and equity (test score standard deviation)

Background -

Idea - state imposes rules that make districts less efficient

Wirt (1977) - created index of state centralization; used 36 components, but hasn't been updated over time

State Share - % share in school revenue correlated 0.40 with centralization index ∴ H&K use state share to capture "state meddling"

Serrano - court case in CA; afterward, several state courts overturned some states' education finance system and other states faced threats of legal action ∴ many states reduced inequality in education spending; impact:

- Districts have less latitude to set education spending... because raising their spending must have increases in other districts to maintain equal spending (i.e., higher price of raising school quality)
- Benefits from political participation on school issues fall... leads to less parental monitoring of schools; less voter scrutiny leads to less efficient schools

Literature -

Fuchs & Reklis (1994), Peltzman (1996), Southwick & Gill (1997) - student achievement falls as state share in revenue rises

Peltzman (1993), Hoxby (1994), Berger & Toma (1994) - state share has inconsistent or insignificant impact on learning

Card & Payne (1997) - equalizing spending narrows the gap in SAT scores between kids from highly educated and uneducated parents

Downes (1992), Figlio (1997) - no impact of state equalization schemes on the distribution of student performance

Contribution - "We go beyond these studies by examining the joint effects of state government's regulatory burden and of state-induced equalization of education spending on the mean and variance of student achievement" (286); "By examining both the mean and variance, we also are able to provide a novel estimate of the tradeoff between equity and efficiency in student achievement" (287)

Why SAT -

- Large number of testers in each state... no small sample problems
- Longer than state aptitude tests... less measurement error
- Incentive... students have incentive to do their best (to get into college)

Problem with SAT - selectivity; average SAT scores are higher in states with lower participation rates; control for it by including percentage taking the SAT

Model -

Production Function Model - mean SAT scores as function of school inputs (quality & quantity of teachers or per-student expenditures) and parental inputs (quality of time spent with children)

Policy & Environmental Variables - capture effects of spending equalization, state bureaucratic involvement, teacher unionization, and private/public competition on school efficiency

Measure of Spending Inequality -

EDUC REVENUE GINI - estimate based on 1972 data (before equal spending laws); use this regression to predict GINI period 1987-1992

PREDICT CHANGE - change in predicted value of GINI from period t and 1972

ACTUAL CHANGE - change in actual value of GINI from period t and 1972

2 Options -

ACTUAL – PREDICTED - "any new state policy that limits or restricts spending variation lowers the actual spending inequality relative to what would have been predicted, which results in a smaller value for this variable" (293)

Translation - any program that equalizes spending makes this variable –; prediction is that equalizing spending results in lower scores (–)... i.e., this should have a + coefficient

ACTUAL $GINI_t$ - used in specifications 5 & 6

Unique - use 12 year average for school inputs

Assumes - equal weight for each year; doesn't account for students moving between states

Data -

SAT - compiled by Educational Testing Service; begin in 1987 (first year with data on parents' education); end in 1992, last year with data available on school resource inequality [at time study began])

Missing Data - 3 states (Arkansas, Hawaii, Vermont); cuts sample to 33 states over 6 years (204 data points)

Results -

"The state's revenue share, which captures state meddling in local decisions, has the expected negative impact on school efficiency. But our novel result is that state-induced spending equalization also lowers average test scores but has had little if any effect on reducing the disparity on student achievement" (285)

Test-Taker-Based Variables

Measure	Predict	Result
PARENTS' EDUCATION - % of test takers' parents with an associate's degree or higher	+	+ & signif
BLACK - % test takers who are black... "account of the historical inferiority of resources devoted to black education" **Problem** - doesn't vary much over time so not significant when including state fixed effects	–	– & signif (w/out fixed)
PUBLIC - % of test takers who attend public school... "studies have found that students in private school learn more than students in public school" **Problem** - same as BLACK; doesn't vary much so not significant when including state fixed effects	–	– & signif (w/out fixed)
SCHOOL SIZE - mean number of students in test taker's senior class	+	
SCHOOL SIZE GINI -	–	
FAMILY INCOME GINI - "tests hypothesis that teaching may be less effective in states with more heterogeneous pupils"	–	
PARTICIPATION- ratio of SAT test takers to the number of public and private high school graduates	–	– & signif

State Public School System Variables

1st Specification (1, 3, 5)		
STUDENTS/TEACHER - student/teacher ratio; measure of class size; quantity of teachers	–	– & signif w/out fixed
TEACHERS' WAGE - real average teacher wage deflated by Chambers' state teacher cost index; measure of teacher quality **Problem** - same as BLACK & PRIVATE	+	+ & signif w/ fixed
2nd Specification (2, 4, 6)		
SPENDING PER PUPIL - real per-pupil spending deflated by state teacher cost index **Problem** - same as BLACK & PRIVATE	+	+ & signif w/out fixed

State Education Revenue Inequality Measures & Financial Centralization Variables

ACTUAL - PREDICTED - used in specifications 1-4	+	+ & signif
ACTUAL$_t$ - used in specifications 5 & 6	+	+ & signif
STATE REVENUE % - percentage of revenue coming form state government (to measure state government's bureaucratic involvement in education)	–	– & signif

Other State Characteristic Variables

UNION - % instructional staff in public schools in union	–	not signif
CATHOLIC - capture competition between public/private	+	

Magnitudes

Parent Education - ↑ 1 StDev ⇒ SAT Score ↑ 28-30 points

State Revenue % - ↑ 1 StDev ⇒ SAT Score ↓ 12-15 points

Test Score Equity -

BLACK - expect + because more heterogeneous... get +

PUBLIC - expect – because more homogeneous... get –

PARTICIPATION - expect + because more heterogeneous... but get – (weird)

ACTUAL - PREDICTED - should be + (to justify more equal outcomes); get + and significant, but only in specification 11 and marginally in 15... 1 of 5 specifications so "result isn't striking"

STATE REVENUE % - not significant

"Voters, left with less control over their local school system, have less incentive to monitor the performance of their schools. Consistent with this reasoning, we find that policies that equalize school spending within a state make schools less efficient. That is, holding school and parental inputs constant, these policies cause test scores to fall." (304)

"Equalizing school resources thus causes a deterioration in school efficiency... According to the fixed-effects regressions, there is no compensating fall in achievement inequality, and consequently, spending equalization is an unambiguously bad policy." (306)

Efficiency vs. Equity - inequality is lower in specifications without fixed effects; not a strong relationship though and trade-off isn't very good: average score falls 4-7 points for a 1-point increase in test score equality

Tax and Spending Limits

Continuation of principal-agent problem in government
Previously looked at voter information and participation (government efficiency depends on voters being aware of and punishing inefficiency)
Now look at examples where voters think they can't control government so they need to enact restrictions on government

Vigdor, "Other People's Taxes: Nonresident Voters and the Statewide Limitation of Local Government," *Journal of Law and Economics*, Oct 2004.

Contribution - alternative explanation for tax limitations (which shouldn't occur under the median voter model because "rational voters would never choose to adopt a binding limit on their ability to raise revenue locally" (454)))
"This paper is a very murky paper"... talking about other people (outside of a jurisdiction) having a say about taxes within a jurisdiction, but the measures don't really capture this

Background -
- **Binding Property Tax Limitation** - prevents some jurisdictions from offering residents their most preferred combination of taxes and services
- **Modified Tiebout Model** - permit voters to have preferences regarding taxes and spending in jurisdictions where they don't live
- **Alternative Theories** - these are for tax limits, but neither talks about preferences of voters in surrounding areas
  - **Leviathan Theory** - tax limitations allow voters to rein in local governments that disobey voter preferences by either overproducing or producing inefficiently
  - **State Regime Shift** - collection of models that imply that voters use tax limitations to force state governments to accept more responsibility for collecting revenue or providing local public goods
- **Massachusetts Proposition $2^1/_2$** - passed on 4 Nov 1980; required all local jurisdictions to levy property taxes at effective rates no greater than 2.5%; dollar amount of tax revenue collected also constrained to grow no faster than 2.5% per year
- **Anecdotal Evidence** - Vigdor claims evidence for nonresident hypothesis because...
  - Barbara Anderson, head of Citizens for Limited Taxation spearheaded drive to enact Prop $2^1/_2$; she lives in Marblehead with effective property tax of 2.3% (not binding)
  - Financing for Prop $2^1/_2$ came from Massachusetts High Technology Council, business consortium rather than organization of residential taxpayers

Model -
- **Nonresident Hypothesis** - "Statewide limitations effectively extend the voting franchise to individuals who have no standing in local elections"; reasons:
  - **Spillovers** - benefit spillovers... should lead nonresidents to want higher taxes
  - **Absentee Landowners** - includes renter-occupied housing and nonresidential land and structures; want lower taxes (don't live in jurisdiction to benefit from government services)
  - **Nonresident Employees** - expect higher wages if there are lower taxes
  - **Marginal Residents** - individuals indifferent between living in their jurisdiction and the jurisdiction in question; if taxes go down, they will want to move and their utility will increase
- **Fixed Effects** - by county to capture regional variations; "counties themselves have virtually no governmental function in Massachusetts" (465)

Measures of Tax Rate Changes - define $\tau = \min\{\ln 0.25 - \ln \tau_{1980}, 0\}$ ... the more negative the number, the more the city has to cut it's taxes; if 0, the tax limit is not binding to the city

Difference in Rate - difference between 2.5% and current rate (τ as defined above)

Average Mandated Rate - average of same measure for cities within 20 miles

Data - 351 cities; # votes for and against Prop $2^1/_2$ from the *Boston Globe* ; half of the cities would be forced to cut taxes

Result -

Dependent Variable - logit transformation of share of voters who favored proposition

Claims data support nonresident theory

More Results - looked at household resorting and property values after the proposition took effect

Problems -

Focus - if you want to key on people's interest in lowering taxes in other communities (i.e., those above 2.5%), should only look at cities below 2.5% tax (or even smaller percentage)

	Unaffected tax < 2.5%	**Capped** tax > 2.5%
Own tax	no effect	+
Neighbor's tax	+	
% renters		–
Employment-Population Ratio		–

Limited Cities - is city at tax limit there because government is spending too much or because the median voter wants more public goods?

Employee-Population Ratio - "That's just stupid"; ignores compensating wage differentials

Renters - "Prisoners' dilemma story I found very confusing"; landlords have to live somewhere... author assumes landlord always lives outside the jurisdiction

Housing Markets - doesn't account for different housing markets

Overall - great idea, but poorly executed

Alm & Skidmore, "Why Do Tax and Expenditure Limitations Pass in State Elections?" *Public Finance Review*, Sept 1999.

Contribution - Look at all state over an extended period of time to explain why state impose tax limits; it's "useful to examine TEL passage using data based on the *actual conditions* (rather than on individual attitudes toward government) in *all states* (rather than in a single state) over an *extended period of time* (rather than at a single point in time)." (483)

Background -

TEL - tax and expenditure limitation... always more credible when you invent TLAs (three letter acronyms)

History - 1978 to 1990, 58 TEL measures were voted on in statewide elections in the US; over 40% of them passed

Problems with Median Voter - "Because the median voter's most preferred outcome has already been selected, it follows that this voter should oppose any changes in the existing levels of taxes and expenditures. Importantly, the voter should also oppose any attempt to impose some limitation on government ax and expenditure decisions" (485)

Denzau & Mackay (1979); Romer & Rosenthal (1979) - bureaucratic suppliers may have some monopoly power in selecting the agenda on which a community votes

Brennan & Buchanan (1980) - view of government as Leviathan ∴TELs "emerge here as an attempt to create political competition by reducing the ability of the monopoly government to control the agenda"
Bell & Fisher (1978) - logrolling
Plott (1967 - cycling
Becker (1983) - interest groups like public sector unions unduly influence outcome

Model -

Supply & Demand - "Voting on TELs should reflect the interaction of demand-side considerations of the median voter and supply-side considerations of the political process" (486)

Net Fiscal Residual - "difference between the expected benefits from public output and the expected cost of taxes"; median voters position is determined by the difference between his NFR under the TEL and without it

Demand - considerations that reflect the preferences of the median voter

- **Demographics**
- **Income** - "higher-income individuals tend to receive less from government than they pay in taxes" (487)... Kenny's explanation: income elasticity of public goods is < 1 so as income↑, people want lower tax rates
- **Tax Price** - measures of tax burden; voter's desire to alter the structure (if not level) of taxation; measure with federal transfers and deductibility (of state taxes from federal income tax)... both effectively lower tax price

  Problem - "taxes and expenditures are necessarily linked, and high and increasing taxes may instead reflect an expressed desire for high and increasing public services" (487) vs. increased tax price; this basic problem is never resolved in the paper

Supply -

- **Growth** - of public sector... gets into the problem of whether taxes are up because voters demand more goods or not
- **Leadership** - Republican vs. Democrat; uncertain sign (e.g., Republicans favor lower taxes, but if government is controlled by Republicans there may be less need for a TEL)
- **Structure of TEL** - specifics of the limitation (e.g., limit rate, limit revenue, voter override)

Three Different Procedures:

Probit - simple model to predict passage; "will generate inconsistent estimates" (491)

Probit - 2 sequential conditions: (i) measure must be placed on ballot ("Ballot"); (ii) measure must receive support of a majority of voters ("Passage"); second probit uses "the inverse Mill's ratio generated from the Ballot equation included as an additional explanatory variable. As discussed in Maddala (1983), this approach yields consistent but inefficient estimates" (496)

Simultaneous Equations - solved by maximum likelihood estimation (MLE)

Data - 1978-1990 data from *The State Tax Review* (Commerce Clearing House, Chicago) and *State Government News* (Council of State Governments, Lexington, Kentucky); 390 data points (30 states x 13 years)

- 58 TELs in 25 states; 25 passed
- Also include 5 other states that don't have initiative or referendum process but have had TEL legislation requiring voter approval during the period of analysis: Alabama, Hawaii, Louisiana, Texas, & West Virginia; Alaska excluded

Result -

"Changes in income and various measures of the tax price of state and local public services are especially important determinants of TEL passage over time... increases in both property taxation and local revenues relative to state revenues increase the probability of TEL passage

Table 4 - (p.502-503)

Ballot Equation - only significant variables are "TEL Already Imposed" and "Welfare Expenditures" (% growth in welfare so negative coefficient is not expected, "Not the most intuitive result I've ever seen")

Problem - need to account for nature of voter initiative programs; states require different percentage of signatures (Wyoming requires 15% so they've never had an initiative make it to the ballot)

Passage Equation - couple of significant variables (aside from "TEL Already Imposed")

Income - + & significant; agrees with income elasticity argument (higher income voters want lower tax rates); assumes elected officials won't cut spending in response to voter desires (i.e., representation system not working)

Federal Transfers - – & significant; more transfers effectively lower the tax price so people get more for the taxes they pay (less likely to pass TEL)

Deductibility - – & significant (sometimes); same argument: lowers tax price

Total Tax Revenues - actually measuring the growth rate in tax expenditures; – & significant which is odd so authors argue "total tax revenues may well capture an increase in the demand for total government spending" (504)

Problem - "Not every story is a good one"... multicolinearity problem between tax revenue and income

Problem - cross equation correlation (RHO) is not significant

Honesty Award - "We do not claim that the empirical specifications here are able to capture all factors relevant to these decisions

Figlio & O'Sullivan, "The Local Response to Tax Limitation Measures: Do Local Governments Manipulate Voters to Increase Revenues?" *Journal of Law and Economics*, April 2001.

Contribution - look at local governments gaming the system under tax limits with potential of voter override by looking at how they choose to cut services

"Some cities subject to a statewide tax limit manipulate their mix of productive and administrative services in an attempt to get voters to override the statewide limit" (233)

Background -

Cutting Service - "one manipulative response is to cut 'service' inputs (for example, teachers or uniformed police officers) by a relatively large amount, while cutting administrative inputs by a relatively small amount" (233)

Literature -

Downes & Figlio (1999) - tax limits increased student-teacher ratios, decreased teacher salaries, did not affect administrative spending, & reduced test scores

Figlio & Rueben (2001) - tax limits are associated with reduced teacher quality

Doyle (1994) - tax limits reduced quality of municipal fire service

Downes, Dye & McGuire (1998) - tax limits in Chicago decreased math scores by small amount, but didn't affect reading scores

Summary - "we use balance-sheet data from 5,150 U.S. cities. We measure the service ratio as the ratio of spending on police and fire protection to spending on general administration. In the years following the adoption of a statewide tax limit, the service ratio decreases by a relatively large amount in cities that have a local-override option. Among cities with override options, the largest reductions in the service ratio occur in cities whose citizens have the least interjurisdictional mobility and in cities run by city managers." (234)

Model - p.235-240... very thorough; basically, a manipulative government will lower the service ratio in order to make the line connecting all tangencies between the median voter's indifference curves and the city budget lines be steeper

Fixed Effects - city-specific and region-specific

Fixes - "we correct our standard errors for heteroskedasticity and within-city error correlation using the correction suggested by Brent Moulton (1999)" (242)

Data - Annual Survey of Governments; unbalanced panel for fiscal years 1975-1986

Filters - pick cities based on

- Contiguous US, excluding DC
- Data in at least 7 of 12 years
- At least 2000 residents

Result - 5,147 cities... 50,702 data points (cover 17 states; a quarter of them have voter overrides)

Basic Service - spending on police and fire protection

Administrative Overhead - spending on general government, excluding financial administration and general public buildings (although get same results if these are included)

Result -

Override vs. No Override - "We observe that there is no significant difference between override and no-override states in the prelimit measures of our three dependent variables from the preceding analysis"; "There is no evidence that override limits are more severe than no-override limits" (243)

"Override limit states reduce their relative police and fire spending by 0.26 more than no-override limit states, a difference significant at any conventional level" (245)... p-value listed is 0.000

Mayor vs. Manager - more electoral responsibility with mayor (no difference in service ratio) vs. city manager ("a large and statistically significant gape between override and no-override" 249)

Migration Potential - "model predicts that the difference between override and no-override cities' responses to tax limitation measure should decline with the migration potential" (251); use Herfindahl index of local government population share in the county... get more gaming in large districts (less competition among governments)

Good Times - "evidence suggests that cities facing good economic times are more likely to act in a manner consistent with seeking an override when presented with the opportunity to do so" (252)

Payoff - "We have no hard evidence that the communities that were most manipulative ended up with the highest revenues (or lowest revenue cuts) following tax limits, all of the suggestive evidence is uniform in supporting this notion." (254)

New York City Example - when faced with budget cuts, the parks and recreation department shut off the lights at the Statue of Liberty

Gainesville Elections - (aside) city council election in March; it's the only thing on the ballot in an election designed for a small turnout, possibly to keep students and faculty from voting; last year the election was during Spring Break, which explains why this year UF has spring break in February

Course Introduction

Paper Summaries - 1 page, single, spaced; should include:
- **Synopsis** - 1 paragraph on what paper is about
- **Data** - 1 paragraph describing data used
- **Identification** - how does author identify policy effects... how do exogenous sources of variation to show causality (vs. correlation)
- **2 Strengths**
- **2 Weaknesses**

Structural Approach - develop theoretical model, then use data to estimate parameters or comparative statics results
- **Good** - regardless of data, model could still be right given the assumptions
- **Bad** - assumes theory is right

Reduced Form Approach - look for exogenous variation (as identified by theory)
- **Good** - clean identification (if experimental data)
- **Bad** - selection and choices are not random; people try to overcome bad identification with advanced statistical techniques... any title "The Effect of X on Y using Z Approach" is a bad sign

A bad structural paper is not as bad as a bad reduced form paper

Marketing - need to "sell" your paper
- How does it relate to other work in the field
- What are the policy implications

Key Question - is there a clearly defined research hypothesis? must be
- Answerable... "falsifiable"; need to be able to come up with a null and alternate hypotheses
- Focused (not too broad)
- Relevant (interesting)

Bad Example: "What happens to kids who take high stakes test?"
This is bad because it's ambiguous and isn't answerable

Better: "What are the effects of high stakes tests on student test scores?"
This has outcome (test scores) and causal mechanism (high stakes tests)
H_0: There are no effects of high stakes tests on student test scores
Problem - not targeted enough:
What kind of high stakes? (e.g., graduation exams; placement tests)
More specific than test scores... e.g., state administered reading and math tests

Get Specific - question should be detailed enough to lead to research questions:
(1) **Data** - what to use, where to get it
(2) **Source of Exogenous Variation** - need to find something that affects causal mechanism (graduation exams) and not performance on outcome (state reading & math tests)
(3) **Methodology** - how to empirically implement the study; specific econometric techniques... this should come after the question, the data and the source of exogenous variation... "Good research is not about technique unless you're an econometrician."
(4) **Interpretation** - what do results say about public policy; if results are apparent before study they may not be interesting

Note: complex method and/or right answer don't guarantee interesting... see John Siegfried's "A First Lesson in Econometrics," *Journal of Political Economy*, 1970

Referee Report -

Details -

Paper - Clotfelter, Ladd & Vigdor, "Federal Oversight, Local Control, and the Specter of Resegregation in Southern Schools,"

Due - 27 Apr

Length - minimum 1.5 pages, single spaced (but keep it under 3)

Summary - 1-2 paragraphs (1/2 page)

- What's the research problem they're interested in?
- Source of identification (just a description)
- Contribution to related literature... since we don't know the literature, it's OK to use whatever CL&V claim their contribution is

Sources of Deficiency - be critical in a constructive way; possible sources:

- Identification
- Alternative explanation for same finding
- What authors could do to make it more convincing (specification check, falsification test, etc.)

Public Policy and Risky Behavior

Black, Devereux & Salvanes, "Fast Times at Ridgemont High? The Effect of Compulsory Schooling Laws on Teenage Births"

Synopsis -

Looks at effect of compulsory schooling on teenage births in the US and Norway.

Compulsory Schooling - measured (in US) by

- Maximum age by which a child must be enrolled
- **Minimum age at which a child may drop out**... this is the main measure because it's what is used in Norway
- Minimum years of schooling before dropping out
- Minimum age for a work permit
- Minimum schooling required for a work permit

Changes -

US - various changes over time and between states; data for 1924, 1924, 1944, 1954, 1964, 1974 for each state + DC (Appendix Table 1 p.42)

Norway - 1959 - increase minimum level of education from 7 to 9 years (i.e., dropout age from 14 to 16); implementation not completed until 1972

Result - compelling women to stay in school until age 16 reduces probability of teen birth by 4.7% in the US and 3.5% in Norway

Policy Implication - teenage childbearing adversely affects outcomes of the mothers and the children; legislation aimed at improving education outcomes may have spillover effects on teen births

Data -

US - IPUMS extracts; 1% 1940 sample, 1% 1950 sample, 1% 1960 sample, two 1% 1970 samples, all 5% 1980 samples from US Census

Restrictions - (a) children only observed if living in household with mother; (b) restrict to women between 20 and 30, (c) assign state based on state of birth, not state of residence

Random Mobility - creates measurement error that will bias estimates towards zero; (on p.18 says mobility is "significant")

Norway - Statistics Norway, "comprehensive data set has been compiled for the entire population in Norway... linked administrative data that covers the entire population of Norwegians aged 16-74

Restrictions - use 1960 data to link women to municipality of birth

Advantages - large and representative data sets; compare effect across two countries

Appropriate - focus on changes in dropout ages rather than school entry ages like McCrary & Royer (2003); also use all women, not just those who did in fact have children (like McCrary & Royer)

Identification - how does author identify policy effects

US - $TEENBIRTH = \alpha_0 + \alpha_1 COMPULSORY + \alpha_2 COHORT + \alpha_3 STATE + \alpha_4 WHITE + \nu_1$

COMPULSORY - vector of three dummies for minimum drop out age (14, 15, 17... 16 is default)

Norway - $TEENBIRTH = \alpha_0 + \alpha_1 COMPULSORY + \alpha_2 COHORT + \alpha_3 MUNICIPALITY + \nu_2$

COMPULSORY - 1 if affected by reform (i.e., drop out age 16), 0 if not (drop out age 14)

TEENBIRTH is binary indicator for whether woman had first birth as teenager ∴ estimate with maximum likelihood probit

Cluster - adjust standard errors for clustering at the state level

Cause - look

- **Incarceration Effect** - "extent that compulsory schooling reduces the time available to engage in risky behavior"
- **Human Capital Effect** - "higher level of human capital could change fertility decisions"

2 Strengths

- **Assumptions are backed up** -
  - Changes in compulsory schooling laws not related to other state characteristics (manufacturing wages, manufacturing employment, expenditures on education, demographic characteristics) - Lleras-Muney (2001) in US; Lie (1973, 1974) in Norway
  - Reform-induced migration not a significant consideration - Meghir & Palm (2003) in Sweden; Telhaug (1969) in Norway
  - **Exception** - compulsory schooling $\Rightarrow$ educational attainment
- **Robustness check** -
  - Urban vs. Rural... law has greater effect in urban
  - US sample tied to race... law has greater effect on whites
  - Inclusion of State-Year trends
  - Alternative weight schemes for Census data (weigh each year the same)
  - Effect of future laws
  - Alternative measures of compulsory schooling
  - Still get same result (more school $\Rightarrow$ lower teen birth rates)

2 Weaknesses

- **Wrong Ages**
  - Exclude women who have first birth before age 15... these are usually the ones that are the most concern when talking about teen pregnancy
  - Although, testing 17-19 is correct for identifying "incarceration effect" vs. "human capital effect"
  - **Younger Pregnancies** - if sole reason for teen pregnancy is lack of human capital, you'd expect girls to get pregnant as soon as they hit puberty
  - "Since children tend to start leaving home about age 16... can only get an accurate count on teenage births for the sample of women aged no more than about 31 (15 + 16). Thus, we restrict out Census sample to women aged between 20 and 30"... seems rather artificial; leave home at 18 and they dropped 3 years of data (20-33)
- **Rational choice**
  - "We know that low-educated women are more likely to have a teenage birth..." see Younger Pregnancies comment above
  - "Assumes women make optimal decisions on timing of births taking into account all the costs and benefits involved. This is often discussed in conjunction with an alternative approach that sees many teenage pregnancies as 'mistakes' resulting from thoughtless behavior, lack of knowledge about the long run consequences, or lack of knowledge about birth control. It is this view that fertility behavior may not be optimal that underscores much of the policy interest in this topic" (Footnote 21, p.21)
  - So policy is interesting because of 'mistakes' view, but paper is based on 'rational choice' view
- **Multicolinearity?**
  - Changes in compulsory schooling in US from 1920s to 1970s... long period of time with few changes; some states don't change at all or only have one change

Other Comments

- **Title** - "Fast Times at Ridgemont High" movie has nothing to do with topic of paper
- **Rhetoric** - US is "punitive in its treatment" of teen mothers (p.2)... p.6 says "unsupportive;" those aren't the same

Vocabulary - "Woman's fertility choices" (p.5)... might choose to get pregnant or to have abortion, but women usually don't have a choice on their fertility

Relevance - bring up abortion (p.7) and claim it's not relevant to the women in the study... but it is relevant today because it's legal so their results don't carry to current situation

Tables - hard to follow which tables are being talked about... "Table 1" vs. "Appendix Table 1"

Selective Reporting - 4.7% is "significant"... 4.7% drop from 17%... actual drop is only 0.8%-points so birth rate drops from 17% to 16.2%... it's all in how you report it (like tax cuts for the rich vs. poor)

David's Comments

Question - can public policy impact undesirable behavior... overall question for this section; for this paper:

Undesirable Behavior - teen pregnancy

Public Policy - compulsory schooling

Question - "Does compulsory education affect one's propensity to become pregnant as a teenager?"

Problem - this sounds like a clearly defined dependent variable (teen pregnancy), but really only use teen birth and may not capture that because of abortion and adoption

Underlying Theory -

Incarceration Effect - more credible story in other work because time in school is not significant compared to time out of school (and time required to get pregnant)

Human Capital Effect - basic cost-benefit analysis... should've spelled this out more

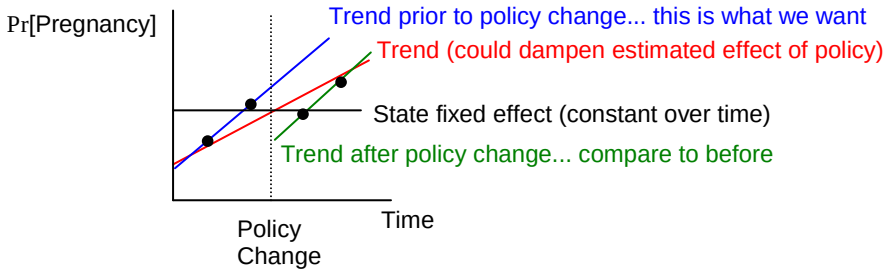
True Relationship? - cost of teen birth high in US and low in Norway, but get similar result; authors use this to argue the relation is correct because it exists in two different settings

Problem - if teen pregnancy is based on cost-benefit test, effect of policy should be bigger in US where cost of pregnancy is higher (relative to Norway)

Methodology -

US - control for state fixed effects (can't compare New York to Mississippi)

Problem - long time frame; industrialization took place at different times in different states; time invariant assumption of state fixed effects is not valid



Trend - should use data prior to policy change, but want lots of data before the change (2 or 3 points is not good for estimating trend)

Better Approach - use fewer cohorts and do difference in difference... probably didn't have enough variation to do this

Endogeneity Problem - why change minimum drop out age? may not be random policy... need to find exogenous event causes policy change (might be able to use political variables to explain timing of change)... need **instrumental variable**

Norway - almost no variation: 1 time change from 14 to 16... effectively only 2 observations; "They act as if they have a million observations but really they have two."
Correction - the change is spread over 12 years so it's OK, but have to ensure time of adoption is exogenous (e.g., socio-economics status not related to time of adoption)
Problem - city size probably related to time of adoption; large city has more capacity/ability to hire more teachers

Questions

- What's drop out rate
- How is compulsory education enforced
- Does average daily attendance change when compulsory schooling changes

Instrumental Variables - can always think of it as omitted variable problem; if OV is related to both dependent and independent variables, could have endogeneity problem

"The plural of anecdote is not data."

Potential Study - school attendance during WADA (used for funding) vs. normal

Public Policy and Risky Behavior

Cook, Ostermann & Sloan, "Are Alcohol Excise Taxes Good for Us? Short and Long-Term Effects on Mortality Rates."

Synopsis -

- **Short Run** - reduction in drinking (from higher excise tax) lowers all-cause mortality; "average drinking has positive effect on all-cause mortality, with an elasticity of about 0.23" (5)
- **Long Run** - "since moderate drinking has a protective effect against heart disease in middle age, it is possible that a reduction in per capita drinking will result in some people drinking 'too little' and dying sooner than they otherwise would."
- **Paper** - simulates effect of one percent reduction in drinking on all-cause mortality for 35-69 year olds... long-term mortality effect is "essentially nil"

Data -

Panel of annual state-level data 1970-2000

- **Survey** - National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) conducted by National Institute on Alcohol Abuse and Alcoholism... representative sample of 43,093 non-institutionalized Americans age 18 and over
- **Alcohol Consumption** - annual sate-level sales per capita ("best-available measure of alcohol consumption") or index of alcohol excise taxes that apply in the state (or both)

Identification - how does author identify policy effects

- **Specification** - one or both measures of alcohol consumption; state and year fixed effects; control for economic conditions (income per capita & employment-population ratio)... same method used in Cook & Tauchen (1982)
- **Simulation 1** - extensive margin; each category of drinker loses 1% of its members so distribution of drinkers is unaffected
- **Simulation 2** - intermediate assumption; both extensive and intensive margin
- **Simulation 3** - intensive margin; uniform downward shift in consumption by drinkers

2 Strengths

- **Policy Implication** - authors took a stand
  - "Our sensitivity experiments suggest that the effect may be positive or negative but is always close to zero.) Since there is no known health benefit form drinking for younger people, and considerable risks, we conclude that the public-health case for increased alcohol taxation is strong" (4)
  - Change is less than 200 lives, but annual deaths in this age group is 700,000 (p.11)
- **Causality & Self-Selection** - realize problems and admit them
  - "Self-selection bias with respect to the decision of whether and how much to drink has been a concern of this literature, but primarily focused on the 'sick quitter' hypothesis, namely that some of those who currently abstain do so because they are sick and hence at greater risk of death. Indeed quitters have higher death rates than lifetime abstainers" (p.9)
  - "These results are based on observational data are subject to a variety of problems of measurement and causal inference" (p.9)

2 Weaknesses

- **Simulation**
  - Never really explained why they used a 1% drop in alcohol consumption
  - Sensitivity was done on the distribution of the 1%, but not on the size of the drop
  - "In column 2 of Table 2, we see that a 1 cent per ounce (1982-1984 prices) increase in the tax index results in a 2.1 percent decrease in sales per capita." (6)

Define Terms

Cirrhosis mortality, injury death rates, all-cause mortality... assumes reader is familiar with

Other Comments

Which Table - doesn't do a good job of discussing the tables (why they're included, what they mean); I read this twice and still couldn't figure it out

Significance - note R^2 in Table 3... all are less than 0.1

Comments from Class

Why care about alcohol?

Short-Term - elasticity of demand... determine how revenue changes when excise tax is changed; originally, excise tax was intended to internalize externalities (DUI, public expenses, pooled insurance, etc), but not other taxes (sales, property, income) are unpopular so "voluntary" (sin) taxes are more important; technically also more efficient because you want to tax inelastic goods

Long-Term - focus of authors; requires "heroic assumption"; could've look at taxes before and result today, but instead use taxes today and forecast to future

Men & women affected differently... (that's because men buy the drinks for the women)

Authors regress alcohol sales per capita against tax rates with state and year fixed effects

- Federal tax add nothing because of year fixed effects (doesn't vary by state)
- Only variation comes when a state changes its tax rate

Results -

- Tax $\uparrow \Rightarrow$ sales/capita $\downarrow$
- Stronger relationship with female drinking (more price sensitive)
- Short-term reduction in mortality in some specifications (cuts DUI, binge drinking, alcohol related violence)
- Long-term reduction in mortality... good idea, but has problems:

  (1) Assumes everything is measured without error; need to incorporate errors from estimates used in forecast

  Example - reduced form instrumental variable regression gets smaller standard errors, but these are incorrect because it assumes there is not error in the first state

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  "Be fully scientific not just when it pleases you."

  (2) Alcohol tax may not be exogenous

  Could be if there is interstate policy copycatting

  Might not be if there is industry protection

  Need information on who changes taxes and when; paper presents no information on state taxes

  "This paper seemed forced into production."

  (3) Only look at sales not consumption; there's strong evidence that people are willing to travel to get cheap alcohol

  Europe - Norway to Sweden; Sweden to Finland

  US - Pennsylvania has strongest alcohol laws; largest liquor store in the country is in Maryland... 50 feet from the Pennsylvania border; it has a drive through that you can only enter from the PA side of the border

  Inflates other state's consumption number (e.g., PA tax $\uparrow$ looks like increased sales in MD)

(4) (John) Doesn't address who is more price sensitive... tax on vintage Bordeaux vs. Night Train (cheap, high alcohol wine); $0.40 on $20 bottle vs. $2 bottle isn't the same; should have different elasticities
(5) No economic theory in the paper; could easily address (4) using theory
(6) Lots of sensitivity analysis for the 1% drop... trivial variations on the same theme
(7) Assuming general equilibrium effects from partial equilibrium result... change in alcohol tax could cause changes in other markets (some people could pick up other "bad" habits which negates the improved longevity authors find)

Overall - because of endogeneity (2), border crossing (3), general equilibrium (7), authors are probably overstating the result of alcohol tax

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Public Policy and Risky Behavior
Corman, Noonan, Rechman & Dave, "Demand for Illicit Drugs by Pregnant Women"

Synopsis -
- Survey data linked to medical records and city-level drug prices to estimate demand for illicit drugs among pregnant women
- **Self Reporting** - drug use from interviews was much lower than based on evidence from medical records; "relying solely on self-reported drug use would lead on to underestimate the responsiveness of prenatal drug use to variations in price" (17)
- **Demand** - $10/gram increase in price of pure cocaine decreases use by 12 to 15%
- **Elasticity** - -0.77 to -1.37
- **Other Results** - more likely to use drugs if:
  - Low education
  - Poverty

  Less likely if:
  - Hispanic
  - Married to baby's father
  - Mother born outside the US

  No effect on drug use:
  - Previous births
- **Policy Implication** - potential of drug enforcement as a tool for improving birth outcomes

Data -
- **Fragile Families and Child Wellbeing (FFCWB) survey**; follows cohort of new parents and their children in 20 US cities (15 states)
  - **Random Sample** - of births in 75 hospitals between 1998 and 2000
  - **Not Representative** - of population of pregnant women because...
    1. Non-marital births overrepresented (75% unmarried mothers by design)
    2. Sampled exclusively in large cities
    3. Sample selection bias (drug use may affect probability of becoming pregnant and decision whether or not to abort)

    Likely to over-represent prenatal drug abusers
  - **Sample Size** - survey for 4898 mothers; medical records (from births) for sub-sample of 1867 births in 10 cities (7 states); using only records that have complete data for all analysis variables cuts sample to **1748**..
  - **Drug Users** - 44% had drug tests in records; 13% (99) had positive tests for cocaine, heroin, marijuana or other drugs; another 91 had drug use indicated in notes from record... total of 190 (10.9%) used drugs... 17% cocaine, 4% heroin, 47% marijuana, 4% other, 28% some combination of drugs
- **System to Retrieve Information from Drug Evidence (STRIDE)** - maintained by Drug Enforcement Agency (DEA); records total cost, amount, and potency of drug purchases by undercover agents

Identification - how does author identify policy effects
- **Measure of Drug Use** - (a) admitted on survey (5.7%), (b) indication in medical record (10.9%), (c) admitted in survey or evidence in record (11.5%)
- **Drug Prices** - standardized for one pure gram of cocaine (heroin) in a given metropolitan area for a given year using

$$\ln \text{Cost}_{ijt} = \pi_0 + \pi_1 \ln \text{Potency}_{ijt} + \pi_2 \ln \text{Amount}_{ijt} + \pi_{3j} \sum \text{MSA}_j + \pi_{4t} \text{Year}_t + \pi_{5jt} \sum \text{MSA}_j * \text{Year}_t + v_{ijt}$$

i^{th} transaction in j^{th} metro area for year t

Only include buys of 40 grams or less

Price per gram $= \exp(\pi_0 + \pi_{3j} + \pi_{4t} + \pi_{5jt})$

Missing Prices - use average price in the state

Intertemporal Reinforcement - "strong addictive properties of cocaine and heroin imply an intertemporal reinforcement effect wherein current consumption is positively affected by past consumption" (11)... so current drug use is affect by past drug prices
$\therefore$ use three-year average of drug price (year of birth plus two preceding years)

"Assume that drug prices are exogenous to the women in our sample" (14)

Control Variables -

Birth Certificate Data - age, education, race/ethnicity, nativity, martial status, previous births

Other Data on Mother - insurance information (Medicaid), whether she lived with both parents at age 15, whether she attended religious services regularly, whether she was married at time of conception, how long she knew father before conception, father's age, father's education

City - unemployment rate, median yearly family income

State - state fixed effects (control for state-level policies on drug treatment and drug enforcement)

Probit Model - dependent variable is 1 if mother used drugs

Model 1 - basic set of covariates (birth certificate data)

Model 2 - stuff from model 1 plus state fixed effects

Model 3 - stuff from model 1 plus city-level data

Model 4 - all mother data plus state fixed effects

Model 5 - everything (all mother data plus city-level data and state fixed effects)

2 Strengths

Link to Medical Records

Most studies on illicit drugs are based on surveys: National Household Survey on Drug Abuse (NHSDA) and national Monitoring the Future survey; self-reported measures of drug use are not reliable (misreporting is correlated with intensity of drug use so lightest users are more likely to lie)

Kaestner, Joyce & Wehbeh (1996) - only 17% of women who tested positive for illicit drug use at the time their children were born reported that they had used drugs

Arendt et al (1999) - concluded combination of medical records analysis and post-partum interview is the base way to ascertain prenatal cocaine use

Medical records - information on prenatal drug use from lab tests of mother and baby and notes from physicians or social workers

Of 190 mothers with evidence of dug use in medical records, < 47% admitted it in their interviews

Background

Grossman & Chaloupka (1998) - used MTF data; found short-run participation elasticity among youths in grades 8-12 was -1.0

Saffer & Chaloupka (1999a) - used NHSDA data; annual participation elasticities -0.3 to -0.6 for cocaine and -0.6 and -0.9 for heroin; (lower values than MTF data because NHSDA represents overall population and MTF is youth sample)

Saffer & Chaloupka (1999b) - used NHSDA data to estimate cocaine elasticities for different demographic groups; elasticity higher for women and youth than for overall sample

Saffer, Chaloupka & Dave (2001) - structural and reduced-form models; illicit drug use varies inversely with state expenditures for drug control

Mensch & Kandel (1992) - National Longitudinal Survey of Youth (NLSY); unmarried teens who use drugs other than marijuana are almost four times as likely to become pregnant as those who don't; also more likely to have abortions, but still result in twice as many live births

Grossman, Kaestner & Markowitz (2002) - more recent data from NLSY did not find conclusive evidence that alcohol and marijuana use by teens leads to increased "risky sexual behavior"

Colman, Grossman & Joyce (2003) - review of literature on cigarette smoking by pregnant women; participation elasticities from -0.2 to -0.7, but closer to -1.0 than broader (non-pregnant) population ∴women who are pregnant are more sensitive to price changes

2 Weaknesses

No Theory

Doesn't discuss why variables are included in the model; no theoretical predictions for signs of coefficients

No discussion of why there are five different models

Then talk about "robustness"... but isn't referring to the five models; new models:

1. Exclude women who were known to use only methadone or marijuana... results "were highly consistent" (18)
2. "Since many of the covariates other than drug prices may be endogenous... we ran additional models that included only age, race, education, and drug prices (plus state fixed effects or city income level)" (18)... similar results
3. Look at other prenatal behaviors: smoking (from survey) and first-trimester initiation of prenatal care (from medical records); trying to measure taste for risky behaviors; admitted endogeneity problem here, but get results "within the range"

Discussion of Drug Price

Not really a weakness, just off topic; lists studies about correlation between drug prices and state-level indicators (certainty of punishment, severity of punishment, etc.); takes a full page of the paper, but never links it to this paper

Comments from Class

Problem with Illicit Drugs - hard to get data

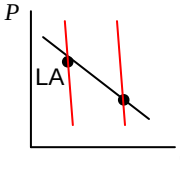
Survey Data - no incentive to respond truthfully; especially underreport illegal activities or socially unacceptable behavior (e.g., did mom smoke or drink alcohol during pregnancy... usually get 1.5% self-reported, but the real number is much higher)

Result - lots of papers using survey data aren't reliable; could have wrong conclusions

Selection Problem - some argue survey data is just a measurement error in a dependent variable, but in some cases is "egregiously mismeasured" so the survey isn't so much an indicator of drug use, but an indicator of who will tell you... that's a selection problem

This Paper - overcomes problem by using medical records to detect drug use

Identification Breaks Down - have to assume demand by pregnant women does not affect price; authors find high elasticity which runs counter to being an addictive substance (based on all economic theory of addictive behavior)



Authors claim shallow line is demand; could be separate equilibrium (steep lines)

Argument - authors say pregnant women are more sensitive to drug prices, i.e., pregnant women and other drug users are separate markets
Problem - can't prove this because both groups have differential incentives to mis-report and physical tests are not useful unless they're random
Figlio - it's just a misspecified equation... price and quantity are jointly determined
3 Year Price - arguing addictive behavior to justify 3 year average rice, but rest of paper assumes users can quit at any time (i.e., not addictive)
Alternatives -
Smoking - could use data on smoking to show difference between pregnant women and other women
Instrumental Variable - find things that impact supply (but not demand)
- Large drug busts of suppliers
- Transportation cost (e.g., latitude... cheaper closer to the border)
- DEA activity... could be jointly determined with level of drug use, but "that would assume a level of sophistication for the federal government that I deem unwarranted".. more likely the DEA activity is a result of congressional districts

Marijuana - not including price, but it's probably not correlated to heroin or cocaine use
Differences - grown locally so price determined by local weather (whereas cocaine and heroin are grown elsewhere and costs determined by other factors); not addictive like cocaine and heroin
Falsification Analysis - (see below) use marijuana price instead; should be no relationship; shouldn't be a relationship the other way either (i.e., long term [3-yr] cocaine prices shouldn't impact short term marijuana use)

Birth Weights - JC asked: why not look at birth weights
Birth Vital Records - can get lots of data and won't be limited to the survey; also have DEA (drug price) data on more cities... more variation (cities) is good; get data on:
Rate of congenital anomalies
Rate of late term deaths
Rate of still births
These are more important than whether the mother actually did drugs; these are the outcomes people worry about may be caused by drugs... study them directly
Other Data from BVR -
Income - know if mother had Medicaid... indicator of poverty
Parent Education -
Policy Implications - will be much stronger; know drug price reduces use isn't very helpful because it's difficult to influence price; knowing which group is having problems allows you to focus advertising or social work to those particular communities

"It's easy to be a Monday morning quarterback"... but looking at a paper and think, 'this is how I'd do it differently' allows you to publish your own work; if the original was just published, you could get into the same journal by commenting on it

Use of Covariates - control variables have different philosophies:
Kitchen Sink (Figlio) - use lots of variables to absorb variation; don't bother to interpret results; called a "saturated" model because the variables "soak up" or "sponge up" the variation
Identification - really means to hold all else equal... add more variables to absorb variation and hold everything equal
Careful (Kenny) - use small amount of theoretically justified covariates; benefit is more credibility for the results if the results agree with theory, but usually get larger standard errors because not as much variation is explained by the smaller number of variables

Alternative - use both... run model with and without fixed effects

Multicolinearity - highly collinear variables have lots of think slices of data with not enough variation so standard errors explode; essentially the same as having a small sample size; only need to worry about it if you're concerned with those variables (i.e., it's OK as long as the covariates you add are not correlated to the variable you want to interpret)

Endogeneity - only worry if it's related to the explanatory variable of interest

Falsification Analysis - proceed with analysis you know is not true as if it were true (e.g., Figlio's study on school lunches being souped up for test days; run model again with different days [i.e., not the real test days]; if you get the same results, it's the specification driving the model, not the data)

Public Policy and Risky Behavior
Grossman, Kaestner, Markowitz, "An Investigation of the Effects of Alcohol Policies on Youth STDs"

Synopsis -

Look at role of alcohol policies (beer taxes and statutes pertaining to alcohol sales and drunk driving) in incidence of STDs among youth

Background -

STDs more prevalent among teens and young adults (5 times more likely to get Chlamydia; 3-4 times more likely to get gonorrhea)

"Numerous studies" show positive association between substance use and risky sexual practices

"Many studies" show alcohol consumption is responsive to changes in alcohol prices

Basic structure like Chesson et al (2000)... impact of beer and liquor taxes on determinants of gonorrhea and syphilis rates among people of all ages... but

1. Use AIDS instead of syphilis (more prevalent)
2. Data extends over longer and more recent time period
3. Also include alcohol regulatory variables (not just price)

Results -

Higher beer taxes associated with lower rates of gonorrhea for males and lower AIDS rates (10%↑ in tax ⇒ 4.7%↓ in males 15-19 and 4.1%↓ in 20-24)

Availability of alcohol (% population living in dry counties) and drunk driving laws (BAC) have no effect

Strict drunk driving policies (zero tolerance) may lower gonorrhea rate among males under the legal drinking age... in FD2SLS model, lower rate by 7-8% in males 15-19

Data -

STDs - Collected by state health departments and provided to CDC through National Electronic Telecommunications System for Surveillance (NETSS)

Gonorrhea - date of diagnosis, state of residence at diagnosis, age at diagnosis, gender; 1981-2001 for ages 15-19 and 20-24

AIDS - date of diagnosis, age, gender, residence... for people in MSAs over 500K people; 1982-2001 for 103 large MSAs for ages 20-29 and 30-34 (likely to contracted at age 12-21 and 22-26

Sample size - 950 for gonorrhea, 1854 for AIDS

Alcohol -

Beer Tax - Beer Institute's Brewers Almanac

Identification - how does author identify policy effects

Assumption - risky sexual behaviors may lead to contraction of STD; alcohol consumption may contribute to contraction of STD because of its effect on risky sexual behavior ∴ "exogenous determinants of alcohol used are hypothesized to reduce STD rates through decreased consumption" (6)

"We assume that any estimated effects of the policies work through a reduction in consumption [of alcohol]. After accounting for area characteristics and time trends, there is little reason to believe that substance use policies may affect STD rates in any other way except through changes in consumption." (6)

Model - $\ln(STD_{jt}) = \alpha_0 + \alpha_1 \mathbf{P}_{jt} + \alpha_2 \mathbf{X}_{jt} + \alpha_3 \gamma_j + \alpha_4 \tau_t + \varepsilon_{jt}$

area j

time t

Alcohol regulatory variables... $\mathbf{P}_{jt}$

Real state & federal excise tax on gallon of beer (proxy for price)...
expect tax$\uparrow \Rightarrow$ STD$\downarrow$

% living in dry county (proxy for availability of alcohol)... expect %$\uparrow \Rightarrow$ STD$\downarrow$

Dummy variables (indicators) for BAC laws (i.e., limit for DUI)
0.10 or higher
0.08 or higher
Youth zero tolerance law (0.02)
Use fraction for year enacted... expect stricter law $\Rightarrow$ STD$\downarrow$

Characteristics of population of area... $\mathbf{X}_{jt}$

Unemployment rate
Real income per capita
% population in rural areas (for gonorrhea model only)
% population 25 or older with bachelor's degree
% state's population identifying with certain religions (Mormon, Southern Baptist, Protestant & Catholic)

Area effects... γ_j

Year effects... τ_t

AIDS Lag - not possible to match each case with the infection date so use average length of time between transmission of HIV and symptomatic AIDS infection (8 years)

Problems -

1. Residual may be serially correlated if there exists unobserved state-specific time-varying factors... fix by using robust standard errors and allow for clustering by area
2. Incidence rate of communicable diseases depends on past incidence or prevalence of the disease... suggests uses lagged STD rate, but Nickell (1981), Baltagi (2001) and others show lagged dependent variable is inconsistent in a fixed-effects model
   Fix 1 - using determinants of lagged STD rate (i.e., lagged beer taxes and percent dry); only use 1 lag because further lags are insignificant
   Fix 2 - use first-difference two-stage lease squares; second lag of STD is employed as an instrument for the lagged first difference; "Beltagi (2001) indicates that the second lag is highly correlated with the lagged difference in most applications, yet it is uncorrelated with the error term" (8)
3. Appropriate lagged STD rate... same sex or opposite sex (hetero vs. homosexual)... fix by using two models: 1 with lagged gender specific STD rates, 1 with lagged total rate

2 Strengths

Causality vs. Correlation -

"If alcohol consumption causes youth to engage in unsafe sexual practices, then reductions in alcohol consumption will also reduce the negative outcomes associated with unsafe sex. On the other hand, if alcohol consumption is simply correlated with risky sexual behavior, then (exogenous) reduction in consumption would have no effect on teens' risky sexual behaviors." (1)

"The question of the causal relationship between teen alcohol use and risky sex remains largely unanswered" (3)

Data Issues - honest about problems

Discussion on state reporting to CDC

Shifting standards for HIV... 1985, 1987, 1993; authors apply 1993 standard

"Gonorrhea rates may be underreported by as much as fifty percent" (13)

Zero rates... use 1 in 2 million to logs can be taken

2 Weaknesses

Area Characteristics

Don't discuss why these variables were selected or how they affect STD rates

Too Many Models

6 regression models presented on each table

Other Comments

Tables - "t-statistics in parentheses, p-values in brackets"... be consistent; easier to always use p-values

Coincidence - if gonorrhea rates trend down and tax rates trend up, is this necessarily correlated or causal?

? - if alcohol only influences male STD rates, are the females sober? are females involved? or is it just that the males are buying the alcohol?

Comments from Class

Outcomes - why do we care about teen sex... regardless of morality, there are public policy concerns because of STDs and pregnancy (kids of teen moms more likely to be poor and more likely to be arrested for crimes)

Spillovers - effects on other people; reason economists care about behavior (sociologists are worried about the behavior itself)

Focus - GK&M focus on the outcome, not the behavior (i.e., focus on STDs, not sex)

Broad View - kudos to GK&M for taking a broader view of drinking by focusing on more than just price and considering other types of public policy: zero tolerance for DUI and % population in dry counties

Problem - didn't focus on policies targeted at youth like underage possession or laws for selling alcohol to minors (e.g., in FL, anyone under 21 caught in possession of alcohol loses his driver's license)

Teens are more worried about access than long-term consequences (so DUI laws not as important); "Eighteen year olds, especially males, don't think about what might happen an hour later."

Other Approach - powerful potential identification strategy is to use policy change that affects some individuals and not others (e.g., compare 19-20 year olds to 21 year olds to see which laws are more important to minors); this wasn't used in this paper

"Politics tend to be arbitrary"... good for identifying exogenous variation

Empirical Work - trying to emulate an experiment; need two things

(1) Random assignment

(2) Groups must be similar *ex ante* (before the policy change)

AIDS Lag - GK&M use 8 year average

Problems - don't know distribution of lag (if 70-90% are at 8 years there's not problem, but if only a small fraction < 20% are at 8 years this doesn't work); don't know for sure for each person and the average length to diagnose is changing over time as is the information available on AIDS which changes the make up of people who catch it

Measurement Error - in the dependent variable...

Random - unbiased, but larger standard error

Systematic - biased estimators

% Dry - several problems...

Describe Variation - paper doesn't talk about variation (e.g., how many counties change from dry to wet); this is one of Figlio's pet peeves

Location - using % dry in state, but should only use counties that re used for other data (and maybe surrounding counties)

Metro Area Dummies - good because some MSAs cross state boundaries

DUI Dummies -

$y_i = \alpha + \beta x_i + \gamma z_i$

Case 1 - this is how the paper did it; Figlio likes this way better

x_i is dummy for ≥ 0.08 and z_i is dummy for ≥ 0.1

Effect of 0.08 (vs. nothing) is $\beta + \gamma$

Added effect of 0.08 (vs. 0.1) is β

Benefit - allows test for difference between moderate and stringent policies

x_i	z_i
0	0
1	0
1	1

Case 2 -

x_i is dummy for 0.08 to 0.1 and z_i is dummy for ≥ 0.1

x_i	z_i
0	0
1	0
0	1

Stata - use `lincom x + z` to test $\beta + \gamma$ (computes correct standard error)

Inappropriate Variables - mixing demand and production functions... can't do this if trying to explain behavior unless there's measurement error; if there's error, there will be portions of the variable that are captured by the error terms so you can try to include the other one to make up for it (e.g., want to use education only, but how do you compare MA from UWF and BA from Harvard? can use income to capture the difference)

OK - if you're only worried about one specific policy instrument, other explanatory variables don't matter so "saturate the model" as much as possible... as long as no variable is highly collinear with the variable of interest

Structural Supply & Demand - nearly impossible to estimate both at the same time because price and quantity are simultaneously determined; best option is to pick one structural model to estimate (supply or demand); use the parameters of that structural equation with unique shifters of the other equation as instruments to estimate price; then use the predicted price with the other variables to estimate the single structural equation (with 2SLS)

Public Policy and Risky Behavior
Kling, Ludwig & Katz, "Neighborhood Effects on Crime for Female and Male Youth: Evidence from a Randomized Housing Voucher Experiment"

Synopsis -
- Moving to Opportunity (MTO) assigned housing vouchers via random lottery... exogenous variation in residential location used to examine neighborhood effects on youth crime and delinquency
- **Epidemic Models** - "like to beget like"; higher local crime rates means lower probability of arrest (actual or perceived) or less stigma of criminal behavior
- **Criminogenic** - neighborhood effects literature links neighborhood processes to crime
- **Causality** - other literature don't prove causality because of individual- or family-level attributes that influence criminal activity and neighborhood selection... authors get by this by having MTO "randomized housing-mobility experiment"
- **Contribution** - first paper using MTO data to use uniform outcome measures from all five MTO cities
- **MTO** - sponsored by US Department of Housing and Urban Development; since 1994; 5 cities: Baltimore, Boston, Chicago, Los Angeles, New York
  - **Eligibility** - low-income families with children in the 5 cities living in public or Section 8 housing in selected high-poverty census tracts
  - **Volunteers** - 4600 families volunteered
  - **Random Assignment** -
    - **Experimental Group** - opportunity to relocate using housing voucher to any area where 1990 census track had poverty rate ≤10%
    - **Section 8 Group** - offered housing vouchers with no constraints
    - **Control** - no services
- **Result** -
  - **Females** - arrests for violent and property crimes went down
  - **Males** - arrests for violent crime down in short run (2 years); problem behaviors and property crime increased
  - **Why?**
    1. Greater discrimination against minority males... authors claim discrimination for MTO youth based on social class not race
    2. Gender differences in adapting to change... authors claim this isn't consistent with short-term reduction in violent crime
    3. "In our view the most likely explanation is that boys are more likely than girls to have or take advantage of a comparative advantage in property offending in their new neighborhoods... it may take time for boys to learn about this comparative advantage" (5)

Data -
- **Police Records** (for arrest data)
  - MTO youth 15-25 at end of 2001, authors have 4-7 years of post-randomization data
  - Match juvenile and adult arrest records using name, race, sex, date of birth, and social security number
  - Data from original states and 15 others; complete arrest histories for 93% of MTO youth
  - "The 'criminal careers' of the MTO control group appear to follow a trajectory that is similar to what has been found for other urban samples" (5)
- **Survey Data** (from MTO)

Completed in 2002 with 1807 youth ages 15-20 from MTO households; 88% response rate (includes both baseline and follow-up subsample survey)
Captured self-reported arrests and "other delinquent and anti-social behaviors" (6)

Baseline - survey at time of enrollment in MTO... characteristics of respondents in later survey match the baseline ("None of the treatment-control differences for any characteristic for either sample is statistically significant at the 0.05 level." (6)

Identification - how does author identify policy effects

"Reduced-form estimate for the net effect of the constellation of neighborhood changes induced by the program" (7)

Intent-to-Treat (ITT) Effect - Compare average outcomes of youth assigned to different MTO groups; "identifies the causal effect of offering families the services made available through the experimental or Section 8 treatments" (7)

$Y_i = \mathbf{Z}_i\boldsymbol{\pi}_i + \mathbf{X}_i\boldsymbol{\beta}_1 + \varepsilon_{1i}$ ... estimated with OLS using clustered standard errors (for kids from same family)

Y_i is outcome of interest

$\mathbf{Z}_i$ is two indicators for assignment to the experimental and Section 8 groups

$\mathbf{X}_i$ is set of baseline characteristics

Modify to allow treatment effects to vary by gender:

$$Y_i = (1-G_i)\mathbf{Z}_i\boldsymbol{\pi}_{20} + G_i\mathbf{Z}_i\boldsymbol{\pi}_{21} + \mathbf{X}_i\boldsymbol{\beta}_2 + \varepsilon_{2i}$$

ITT is represented by $\boldsymbol{\pi}_i$, $\boldsymbol{\pi}_{20}$, and $\boldsymbol{\pi}_{21}$

Treatment of the Treated (TOT) - treatment is relocation through MTO; TOT identifies effect of moving through MTO compared to what would have happened without moving; ITT effect divided by difference in treatment take-up rates... "we use two-stage least squares with treatment group assignment as the instrumental variable for treatment take-up" (9)

2 Strengths

Data

Very clear description of the data in the appendix
Talk about missing data and how it's dealt with (e.g., missing police data on address gets city's overall crime rate)
Check statistics to make sure samples are representative

?

2 Weaknesses

Policy Implication

Compare lifetime social costs of criminal offending for youth across MTO groups... didn't really discuss this in intro prior to just tossing it out there on p.10... all for nothing because "the effects are not statistically significant" (10)

Length

Actual paper could be half as long
Starts off very carefully explaining what was done, then discussion of the results rambles on and on
Almost half the paper is footnotes or appendices!
Spends a majority of the time talking about why there's a gender difference... even quoting psychology literature
Conclusion takes four pages?!

Other Comments

Self Selection - still have problem of selection for program volunteers

Comments from Class

Experiment - empirical work tries to emulate an experiment; KLK use data from an actual experiment... Katz worked as chief economist for HUD when the MTO program was designed... amazing amount of money ($5 million just for the analysis!)

Neighborhood Effects - also called peer effects; when mixed with certain group of people, behavior is influenced; used in papers on rime, drug use, sexual behavior, and test scores

- **Reflection Problem** - people aren't randomly assigned to peer groups (self-selection); something caused peers to come together (common unobserved attributes)
- **Broken Windows Hypothesis** - if you see neighbors with broken windows (property in disarray), you're more likely to not care about your own property (or to vandalize other properties)
- **Brown vs. Board of Education** - stopped "separate but equal" arguing equal resources are not enough... based on assumption that peer effects are important

"There's about four ideas in economics" and this one is **MB > MC** -

- **Marginal Cost** - perceived/actual MC of criminal behavior... getting caught, jail time, job loss... if person thinks there are such poor job opportunities, his MC of crime (losing job) is low
- **Switch Neighborhoods** - MC↑ (better opportunities, better security, etc.), but also have MB↑ (more valuable property)

Multiple Sites - trying to mitigate potential for non-random assignment (i.e., preferential treatment from social workers); also had practical reasons (spread to more districts to get funding from Congress)

Multiple Groups -

- **Control** - get public housing
- **Section 8** - get voucher for rent.. voucher effect
- **MTO** - get voucher with restrictions (must move to low poverty neighborhood).. voucher effect + neighborhood effect
- **Treatment of Treated** - MTO - Section 8... cancels the voucher effect to isolate the neighborhood effect

Combined Data - combine administrative data (good, but shallow) with self reports (have to worry about mis-reporting if people think there's something to lose)

- **Response Rate** - fairly high
- **Weighting** - sociologists like it; economists split; gives particular set of respondents more importance
  - **Good?** - could undermine analysis if hard to find people (weighted in this study) have systematically different results
  - **Aggregate Effect** - use weights
  - **Individual Outcomes** - don’t use weights
  - **Compromise** - report with and without weights

Time Period - KLK use long period and see different effect as time passes

Lots of Zeros - 90% have no arrests so OLS regression not good for number of arrests; use a count model (negative binomial)... lots more technical econometrics talk I didn't catch

Problems -

- **Selection** -people self-select into experiment; also have to worry about how people learn about the program (could be systematically different than those who don't know)... could have people who are particularly dissatisfied with current housing so results are false positive
- **Voucher** - section 8 voucher ≠ MTO voucher (MTO is bigger) so it doesn't completely cancel out the voucher effect
- **Discouragement Effect** - people view themselves as worse off if they're not selected for MTO so could have biased control group

Discrimination
Antonovics & Knight, "A New Look at Racial Profiling: Evidence from the Boston Police Department."

Synopsis -
- **Claim** - distinguishes between preference-based & statistical discrimination in racial profiling
- **Previous** - model from Knowles, Persico & Todd (2001); show it's not robust to alternative modeling assumptions
  - **Problem** - model depends on specializes shape of best response functions
  - **Change** - A&K assume officers are heterogeneous in their preferences for search (which doesn't work in KPT model)
- **Result** - Find officers are more likely to search if race of driver is different than race of officer
- **Alternatives** - look for other explanations; results still hold
  - **Different Ability** - look at officers with greater than 10 years of experience (less informational asymmetries between officers of different races)
  - **Officer Assignment** - officers not randomly assigned to neighborhoods

Details -
- **Motorists** -
  - **2 Types** - African-American (a) or white (w)... race $r \in \{a, w\}$
  - **Characteristic** - c; potentially useful to police in determining whether or not to search; not perfectly observed by the econometrician
  - **Decision** - weigh benefit ($v(c,r)$)of carrying drugs against penalty ($-j(c,r)$)
    Expected payoff... $-\gamma(c,r)\,j(c,r)+[1-\gamma(c,r)]v(c,r)$
    Carry drugs if expected payoff > 0... $\gamma(c,r) < \dfrac{v(c,r)}{j(c,r)+v(c,r)}$
  - **Carrying** - $\pi(c,r) =$ probability motorist of type (c,r) is carrying drugs
- **Police Officer** -
  - **Benefit** - normalized to 1
  - **Cost** - $t_r =$ cost of search motorist from group r
  - **Search** - $\gamma(c,r) =$ probability motorist of type (c,r) gets searched
  - **Decision** - maximize expected payoff from making an arrest minus cost of search
    Search if... $\pi(c,r) - t_r > 0$
    Assumes search of motorist who has drugs will find the drugs
- **Best Response** - equivalent to matching pennies game (figure 1)
  - **Equilibrium** - motorist indifferent between carrying drugs; cop indifferent between searching
  - **REALITY CHECK** - this doesn't sound realistic... not every motorist thinks about carrying drugs in their car
- **Motorist Heterogeneity** - change expected benefit to carrying drugs to $-\gamma(c,r)\,j(c,r)+[1-\gamma(c,r)]v(c,r)-Z$ (where Z is individual cost of carrying drugs; $G(\cdot)$ is distribution of Z)
- **Preference-based Discrimination** - "Police officers in this model are defined to have discriminatory tastes if the cost of search varies by the race of the motorist, so that $t_a \neq t_w$" (8)
  - **NO** - could be statistical... more/less likely to get sued, get complaint filed, get shot, etc.

Statistical Discrimination - "occurs whenever the net benefit of carrying drugs differs by race" (8)

REALITY CHECK - this can't be measured!

Result - somehow this all translates to "probability of guilt conditional on search is independent of the motorists race" (9)... econometrician need not observe c to distinguish statistical and preference-based discrimination

Problem - "Any alteration to the model that smoothes out the best response function for police officers will render [KPT's] test invalid" (9)... such as allowing them to be heterogeneous in preference for search: $t_r + U$ (where U is individual search cost with mean zero; $H(\cdot)$ is distribution of U)

Alternative - A&J propose discriminatory preferences are directed towards motorists who are of different race than officer; $t_r^j =$ cost to officer of race j of searching motorist from group r

Data -

Chapter 228 in Acts of 2000, *An Act Providing for the Collection of Data Relative to Traffic Stops* - effective April 1 2001, Registry of Motor Vehicles collect data on identifying characteristics of all individuals who receive a citation or who are arrested

Includes - age, race, & gender of driver; year, make & model of car; time, data & location of stop; alleged infraction; whether search initiated; whether stop resulted in arrest

Officer Data - from Boston Police Department; race, gender, rank & number of years on the force

112,473 citations by 1,369 officers

Drop Data - Asian officers; citations to Asian, Native American, Middle Eastern motorists; motorists outside city of Boston... 100,408 citations by 1,335 officers

More Drops - all officers for whom search is missing for more than 10% of citations... 48%!!; drop citations for remaining officers with search data missing... leaves sample of 72,903 citations from 684 officers

REALITY CHECK - 48% officers dropped, but only 27% of citations dropped

Identification - how do authors identify policy effects

Probit - $\Pr[\text{search} \mid j,c,r) = H[\pi(c,r) - t_r^j]$

Key - equilibrium guilty probabilities ($\pi(c,r)$) are independent of officer race; "this independence is key to our identification strategy (12)

Fully Specified - can't estimate because of perfect collinearity

Restricted Model - Assumes c is observed

$$\Pr[\text{serach} \mid j,c,r) = H(\beta_0 + \beta_1 c + \beta_2 1[j=a] + \beta_3 1[r=a] + \beta_4 \text{mismatch}$$

where $\text{mismatch} = 1[j=a, r=w] + 1[j=w, r=a]$ (i.e., race of officer and motorist are different)

Assumes white and black officers equally prejudiced ($t_a^a - t_w^a = t_w^w - t_a^w$)

Relationship	Interpretation
$\beta_2 = t_w^w - t_a^a$	Cost differences by officer race
$\beta_3 = \pi(c,a) - \pi(c,w)$	Statistical discrimination
$\beta_4 = t_a^a - t_w^a = t_w^w - t_a^w$	Racial prejudice

I'm not convinced this is correct

Actual Model - c is unobserved; "under assumptions of normality and random matching of officers and drivers, our approach retains the ability to distinguish between racial prejudice and statistical discrimination *even if unobserved driver characteristics are correlated with driver race*" (13)

$c = c_r - \sigma\varepsilon$, where $\varepsilon \sim N(0,1)$ and is independent of driver race (r) and officer characteristics (U, j)

Normality - without normality assumption, unobserved characteristics lead to "complicated asymptomatic bias formulas in probit models" (13)

Assume U & ε are independently distributed, $U - \sigma\beta_1\varepsilon \sim N(0,1+\beta_1^2\sigma^2)$

$$\Pr(\text{search} \mid j,r) = H\left[\frac{\beta_0 + \beta_1 c_w + \beta_2 1[j=a] + [\beta_3 + \beta_1(c_a - c_w)]1[r=a] + \beta_4 \text{mismatch}}{\sqrt{1+\beta_1^2\sigma^2}}\right]$$

Relationship	Interpretation
$\gamma_2 = \frac{t_w^w - t_a^a}{\sqrt{1+\beta_1^2\sigma^2}}$	Cost differences by officer race
$\gamma_3 = \frac{\pi(c,a) - \pi(c,w) + \beta_1(c_a - c_w)}{\sqrt{1+\beta_1^2\sigma^2}}$	Statistical discrimination
$\gamma_4 = \frac{t_a^a - t_w^a}{\sqrt{1+\beta_1^2\sigma^2}} = \frac{t_w^w - t_a^w}{\sqrt{1+\beta_1^2\sigma^2}}$	Racial prejudice

I'm even less convinced this is correct

Control Variables -

Night (6pm-5am)
Driver below age 25
Driver male
Driver from in state
Driver from in town
Accident occurred
District

Weighted Probit - "If you were interested in understanding the behavior of the average officer, the weighted probits provide a better description of the data since officers who issue a large number of tickets do not exert a disproportionate impact on the estimates" (18)

2 Strengths

Data - direct from MA and BPD

Maybe Not -

- "For approximately 20 percent of the citations issued by an officer in the Boston Police Department in our data, we were unable to identify the officer who issued the citation" (16)... that's pretty sad
- "The search variable is missing for over 18 percent of the citations in our data." (16)

Robustness - check for potential bias on mismatch variable

"It is comforting that the point estimate on mismatch changes very little as we add more repressors, suggesting that mismatch tends not to be correlated with unobserved motorist characteristics" (20)

Search Cutoff - changed cutoff from 10% to 5 and 3... strengthens the result; increasing the cutoff weakens them

Officer Experience - look at only patrol officers

Officer Assignment - re-run only using motorists who are residents of the district in which they are pulled over; coefficient on mismatch remains positive and statistically significant

2 Weaknesses

Distinguishing - "it is not easy to empirically distinguish between these two possibilities" (2); "it is generally impossible to distinguish between statistical discrimination on the basis of race and statistical discrimination on the basis of characteristics that are correlated with race but that are unobserved to the econometrician" (3)

Statistical Discrimination - "reasonably justified by racial differences in crime rates"; "racial differences in the propensity to commit crime"

Preference-based Discrimination - "purely racist policing practices"; "discriminatory preferences against members of a particular group and act as if there is some non-monetary benefit associated with arresting or detaining members of that group"

I'm still not convinced you can tell the difference with econometric data

Normality Assumption - A&K try to pass off their model as being so much better than KPT's model, but their model is dependent on the normality assumption; since they can't even observe the characteristic, how do they know it's normally distributed?

Other Comments

Other Characteristic - p.4 talks about other characteristic not known to the motorist (e.g., nervousness); this discussion is not very convincing and doesn't address the difference between preference-based and statistical discrimination

Not Clear - introduction describes both models, but it's not clear what the authors are talking about:

Model 1 - statistical discrimination alone $\Rightarrow$ search decisions should be independent of officer race... this is A&K's model

Model 2 - no preference-based discrimination $\Rightarrow$ probability of guilt conditional on search will be the same for all identifiable groups of motorists... this is KPT's model

Table 1 - "The patterns in Tables 1 and 2 are inconsistent with standard models of statistical discrimination" (6); don't look that bad to me; the thing that jumps out to me is Hispanic cops not searching very often

Results - using search is OK, but the big issue are search results; if cops search more and find actually things, that supports statistical discrimination

Reason - cops search cars for more than just drugs

Skewed Data? - MA law collects data for citations and arrests... doesn't cover all stops... selection bias?

Robustness - having results that are robust to data does not mean the model itself is robust

Asymmetric Search - "If officers are better at finding drugs when the motorist is a member of the officer's own racial group, then we would expect officers to be more likely to search motorists form their own racial group" (22)

The statement assumes all racial groups are equally likely to carry drugs

NO - talking about lower search cost (or higher Pr[find drugs | search & drugs]); this does not mean the officer will search his race more if Pr[drugs] is low for that race... again, this is confusing statistical and preference-based discrimination

Un-Discrimination? - "Interestingly, we see that officers disproportionately issue citations to motorists from their own racial group" (17)

MAJOR FLAW - "our results are stronger when we examine only experienced officers, for whom we would expect the likelihood of a successful search to be independent of the match between the officer's race and the driver's race" (23)... this result suggests their interpretation of the data is incorrect; if there is evidence of more experienced officers discriminating, if you assume the discrimination is based on the experience then that's evidence of statistical discrimination

More Uncertainty - "Here we deliberately appeal to racial stereotypes about who buys and who sells drugs" (24)... would those be statistical or preference-based stereotypes?

Oops - should there be a swastika in a paper on racial profiling? (see figure 1)

Class Comments

History of Public Economics -

Public Finance - optimal taxation, dead weight loss, etc. (Hamilton's class)

Public Choice - rational choice, voting models; close to political science (Kenny's class)

Now - expanded to policy analysis; overlaps other fields, but economists use more advanced tools (15 years ahead with experimental approach)

Discrimination - economic activity that is suboptimal (reducing feasible set); typically studied by criminologists (legal issue) and sociologists (look for root causes)

"Rules of evidence in a court room aren't necessarily the rules of science"

Racial Profiling - police accused of making assumptions that certain type of person is more likely to be a criminal; leads to people saying they've committed the crime of driving while black

Proof - that's the point of the paper: to determine if there is evidence of racial profiling

Sophistication - driver knowing rights may be less likely to be searched; if sophistication is correlated to socio-economic group which is correlated to race, there could be less search of come types (potential bias)

KPT - explained a little different in class... looked at

Pr[search | pulled over] - data shows this is more likely for blacks

Pr[guilty | search] - data shows not more likely for blacks

Problem - guilt could be relatively random even so Pr[guilty | search] is always the same

Nice Start - A&K reproduce KPT's results with their data

Statistical Discrimination - "rational"; model predicts it should be the same across races of police officers

Intellectual Honesty - good part of A&K; they do everything "hands above the table"; style is close to a paper you might want to emulate (others are so set on trying to get the result they want that they try to trick the reader... we'll study this later with Hoxby)

Robustness - developed rule to deal with unchecked search boxes; used different criteria to show impact on results

Weighting - discuss whether to do it; present results with and without

Own Race - studies show people are more observant of their own race; could be that they rely on statistical discrimination on other races; should add another table using conditional guilt (which A&K didn't use except to replicated KPT's results

Problems

Other Factors - ignore other factors (car type, car year, car modifications, driver age, driver appearance, etc.)

Empirical Studies - blacks and whites in same income group drive different cars, smoke different cigarettes, watch different TV shows

Traffic Stops - paper assumes stops are exogenous, but in real world they're discretionary (non-random)... e.g., cop can identify a suspicious car (fits particular type, too expensive (or not enough) for particular neighborhood)

Black on White - A&K look at black on white discrimination and find a bigger gap than white on black in basic statistics; model assumes these are the same

No Better - can't think of a better way to do it, but I don't believe the results; "It just feels wrong"... never established discrimination (or difference between statistical and preference-based)

Discrimination
Autor & Scarborough, "Will Job Testing Harm Minority Workers?"

Synopsis -

Belief - equity-efficiency trade-off of testing: improves selection but reduces minority hiring; based on two assumptions: (1) employment tests provide a valid predictor of worker productivity; (2) absent of job testing, firms hire in a manner that is blind to the tested attribute (so testing reducing hiring for groups with below average test scores)

Statistical Discrimination - using group demographic characteristics (education, gender, race, etc.) to assess expected productivity of job applicants; profit maximizing employers have incentive to use it; will result in equal productivity of marginal hires from each group so "the trade-off between efficiency and equity in hiring is an empirical possibility rather than a theoretical certainty" (3)

Result -

More productive hires (median tenure up 10%; fewer fired)
8.8 days more with test (22.1 when controlling for site and time fixed effects)
No measurable impact on minority hiring (although minorities and low socio-economic status applicants performed significantly worse on the test)
These result imply informal screening used statistical discrimination

Unique - adds to literature because...

1. Use private sector (instead of military) because greater pressure to screen optimally
2. Phased rollout allows comparison to previous system
3. Extend beyond hiring phase to look at productivity of hires

Data - 1,363 stores for large, geographically dispersed retail firm (47 states); switched from informal screening to computer-supported screening process over a 12 month period (1999-2000)

Hiring Data -

Company - personnel records have demographics (gender, race), hire date, (if applicable) termination data and reason

Applications - self-reported gender, race and zip code (for store where applied)

Census - racial composition and median household income in each store's location

Prior Data - get data for workers hired 5 months prior to system rollout

Applicant Test Scores - database with all applications (214,688) during year following rollout (didn't keep data during rollout)

Total - drop for missing gender or race... use 34,247 workers hired (25,820 without testing; 8,427 with testing

Identification - how does author identify policy effects

Difference-in-Difference Model -

$$D_{ijt} = \alpha + \mathbf{X}_{ijt}\boldsymbol{\beta}_1 + T_{ijt}\beta_2 + \theta_t + \varphi_j + e_{ijt}$$

worker i hired at site j in year and month t

$\mathbf{X}_{ijt}$ has worker race and gender

T_{ijt} is 1 if test, 0 if no test

θ_t is month and year effects ("to control for seasonal and macroeconomic factors)

φ_j store site effects ("absorb fixed factors affecting job duration at each store)

Correlation - "Since outcomes may be correlated among workers at a given site, we use Huber-White robust standard errors clustered on store and application method" (19)

Endogeneity Issues -

Test Status - concern about data in first couple months of rollout; resolve by using instrumental variable for store-test-adoption (first observed tested hire)... results not much different than OLS

Timing - timing of adoption is not necessarily random

Quantile Regression - data is right-skewed so use least absolute deviation regression model; have to switch to state dummies instead of store dummies; result is increased median tenure by 8 to 9 days (similar to OLS); also have monotonically increasing tenure from 10th to 75th percentile

Disparate Impact on Productivity - black-white test score gap of 3.9 points, but only 1.5 points for hires so suspect productivity gap is narrowed; run model with average test score for store's applicants; results in 11 day narrowing of initial 33 day gap

Firing for Cause - repeat analysis with new dependent variable

$$E[1\{O_{ijt}^{180} = k\}] = \alpha + \mathbf{X}_{ijt}\boldsymbol{\beta}_5^k + T_{ijt}\beta_6^k + \theta_t^k + \varphi_j^k$$

$1\{\cdot\}$ is indicator and k corresponds to three outcomes of O: employed, neutral termination and termination for cause (theft, job abandonment, insubordination)

Look at 180 days after hire

Result - without testing 9% points more likely for blacks (3% for Hispanics) to be fired for cause within first 180 days; with testing, 4.4% points more likely to remain employed, but "we find no evidence of a disparate impact of testing on terminations" (25)

Disparate Impact on Minority Hiring -

Fixed Effects Logit - $E(B_{ijt} \mid H_{ijt}, A_{ijt}, T_{ijt}, \theta_t, \varphi_j) = F(\theta_t + \varphi_j + \beta_7 T_{ijt})$

B_{ijt} is 1 for black worker

$F(\cdot)$ is cumulative logistic function

β_7 measures impact of job testing on the log odds that a newly hired worker is black... captures combined impact of testing on both relative application rates and hiring odds by race... former should be captured by store fixed effects

Linear Probability Model - for robustness check; $E(B_{ijt} \mid H_{ijt}, A_{ijt}) = \alpha + \beta_8 T_{ijt} + \theta_t + \varphi_j$

None of the changes in hire rates were significant

More Robustness - redo using measures of minority share or median income of residents in store's zip code

"Despite sizable racial differences in test scores, we find no evidence that job testing had disparate racial impacts on hiring at the 1,363 stores in our sample" (30)

2 Strengths

Data - not just the data itself, but the details behind the data source, including the firm, the job, and the hiring procedures; it sounds like the authors really know what's going on

Honesty -

- "Notably absent from our data are standard human capital variables such as age, education, and earnings" (7)... not a big deal because of job
- No wage data... also not a big deal because it's a minimum wage job and controlling for year and month will absorb the wage variation
- Admit to not having test scores from all applicants during rollout; compare productivity data for workers before and after testing to ensure sample is reasonable
- Distinguishes between percentage points and percentage changes (e.g., p.24... "4.4 percentage points (14 percent)")

- "Although we have no evidence suggesting that testing altered the racial composition of applicants, we also cannot offer evidence against this hypothesis." (27)
- Caveats: data from one retailer; differences between groups not as large as other standard ability tests, only consider firm's private gain

Theory - provide long section on various theories that can explain possible empirical outcomes

"Does job testing have a disparate impact on the hiring rates and productivity (conditional on hire) of a versus b workers? As we demonstrate, the answer depends on how firms screen applicants in the absence of testing" (10)

Screening - 3 types:

Unsystematic - same probability of hire for all groups; testing will result in less hiring for less productive (lower scoring) group, raises productivity for both groups, and reduces productivity gap between groups

Naïve Selection - "firms discriminate on basis of the productivity information contained in η_0, but they do not use demographics" (12); testing results in downward adjustment of screening threshold, results in less hiring for less productive (lower scoring) group, raises productivity for both groups, and reduces productivity gap between groups

Statistical Discrimination - firms use demographic group membership for additional productivity signal (illegal in US); testing results in upward adjustment of screening threshold, more hiring for lower scoring group, raises productivity for both groups, and increases the productivity gap between groups

Quotas - look at adjustments if firm is required to maintain constant hiring rates

Result - testing raises productivity; effect on low scoring groups (minorities) is ambiguous

2 Weaknesses

Productivity Measures -

Duration - length of completed job spell duration is not necessarily the same as productivity; in the sense that there are costs associated with hiring workers length of employment is important, but it doesn't say anything about sales generated by the employee

Firing - this captures another aspect of productivity, but not necessarily the right one (e.g., there could be an employee who works for a long duration and then is fired... this would be considered productive by the first measure, but not the second)

Theory - notation seems much more difficult than it needs to be

Other Comments

Parameters - very careful to always change subscripts for β coefficients, but never uses them for α; do all models have the same intercept term?

R^2 - except for Appendix Table 1, all the R^2 values are very low (0.1 or less)

Comments from Class

Discrimination - computer test effectively eliminating preference-based discrimination (but keeping statistical discrimination if it was present); differences in hiring rates could be associated with preference-based discrimination

The Good -

- Data (before and after for each store)
- Temporal variation in rollout... similar to the Black paper on compulsory schooling

The Bad -

- Little actual variation

  Potential Reasons for a Zero Effect:

  1. Bad model
  2. Measurement error in dependent variable
  3. Little actual variation in data
  4. Really is a zero effect

  Better Scenario - this can't be controlled by the authors (or the retailer), but identification would be better if some states mandated the change so the rollout of the computer test is initiated by a non-random event
- Potential systematic difference between stores that implement the computer test first
- Self-selection for applicants; those who might show up to interview may be affected by the test (e.g., if they think the test is biased against them they self-select out of it)
- Dropping data missing gender or race (and didn't say how many observations were dropped)... not good because race is one of the things they authors are focused on; missing data probably is not random; better way would be to use a dummy variable to control for missing data

Discrimination
Figlio, "Names, Expectations and the Black-White Test Score Gap"

Synopsis -

Two Questions:

1. Do teachers treat kids differently based on name? ("factors other than observed ability"; name is "signal of unobserved parental contributions to child's education")
2. Do expectations affect outcomes? (expect less, get less)

Use data from state to establish link between names and low socio-economic status (proxied by mother being high school drop out)

Use data from school district, comparing pairs of siblings, to answer questions

Result - teachers do treat kids different based on names which translates into differences in test scores

Data -

Names - birth certificate data from all children born in FL between 1989 and 1996

- Birth weight (measure of adequacy of prenatal care)
- Indicator for labor or delivery complications
- Mother's age
- Mother's education
- Mother's marital status
- Indicator if father is known

Students - 1994-95 through 2000-01 for "large Florida school district"
55,046 students from 24,298 families (2 or more students per family)

Identification - how does author identify policy effects

Names - 3 measures: prevalence of name, indicator lf "Blackness", indicator of socio-economic status... then p.14 says this or the number of low socio-economic status attributes (confusing)

Socio-Economic Status - regress phonemic components against maternal drop out status (i.e., use names to predict probability that baby's mother is a high school dropout)

Phonemic Components - combinations of sounds, letter orders, and punctuation; 4 types "particularly striking"

(1) prefixes: "lo-", "ta-", and "qua-"
(2) suffixes: "-isha" and "-ious"
(3) apostrophe
(4) Scrabble points > 20 (particularly long with several low-frequency consonants)

Students - exploit within-family differences in names

Sibling Pairs - proxied by students sharing same address and phone number

Test Score - national percentile ranking on norm-referenced test... comparable across years and tests and across grade levels (important to compare siblings)

$$(\text{Test NPR})_{ift} = \alpha_f + \beta(\text{Black name ratio})_i + \delta(\text{Attribute index})_i + \lambda(\text{Name frequency})_i + \gamma(\text{Birth order})_i + \eta(\text{Sex})_i + \theta(\text{Data from vital records})_i + \varepsilon_{ift}$$

student i in family f at time t

α is family fixed effect

Vital records - all from above ("Data" section); use flag for missing data

Cluster - at student level

Low Expectations - conditional on test scores, less likely to refer to gifted program, but more likely to promote to next grade

$(\text{Grade promotion})_{ift} = \alpha_f + \theta(\text{Math \& reading test score NPR})_{ift} + \beta(\text{Black name ratio})_i + \delta(\text{Attribute index})_i + \lambda(\text{Name frequency})_i + \gamma(\text{Birth order})_i + \eta(\text{Sex})_i + \mu(\text{Data from vital records})_i + \varepsilon_{ift}$

Linear probability specification

Grade Promotion- "if teachers have lower expectations of students with low socio-economic status names, one would expect the coefficient on δ to be positive" (13)

Gifted Referral - "teachers have the flexibility to determine which students should be referred for potential placement into the gifted program" (4); use variants of model for grade promotion using gifted referral as dependent variable; lower expectations $\Rightarrow$ coefficient on δ to be negative

2 Strengths

Name Background

Experimental Evidence - blacks treated differently in labor market

Expectations Matter - higher standards lead to higher test scores

Social Psychology - papers on measuring differential perceptions of black and white children; papers on names affecting self-perception and others' perceptions

Effect of Names - none for racially-identifiable... so focus on low socio-economic status

Result on Names - I like the explanation and examples (pp.6-7 & Table 1)

Identification - using sibling pairs is great... fortunately the data allowed it; going through details to verify variation exists is good (p.8)

Concern over validity on p.16-17 (use siblings born within two years with same father [last name])... results even work with twins (least variation in family conditions and home life)

2 Weaknesses

Results - most results are less than 1 percentage point; there may be statistical significance because of the large sample size, but I'm not sure the results are economically significant

Details - no reports on regression for names predicted mother's education (socio-economic status); what is the R^2? how significant are the different measures?

Only 12% - "my measure of name socio-economic status is imperfect, and it only singles out 12 percent of all children as having low socio-economic status names" (9)... 12% actually sounds high to me

Preferred vs. Full - p.18 footnote talks about results with full population; it would be nice to have the full tables to compare them

Organization - I know this is nit picking, but I really can't find much to comment about on the technical side. Although I found everything easily understandable, there are sections that are repetitive, sections that seem out of place and sections that seem unclear

Repetitive - state paper's purpose on Par.1 on p.2, Par.1 on p.3, Par.1 on p.4, Par.2 on p.4, Par.2 on p.18 ("Estimated effects of names..."; that paragraph also goes into gifted selection vs. grade promotion discussion that was covered on p.12)

Unclear -

p.4 introduces use of grades and "expectations"... the expectations part is not clear (combination of gifted referral & class promotion)

p.5 talks about 3 measures: prevalence of name, indicator of "Blackness" and indicator of socio-economic status; only the last one is discussed

p.12 had only talked about gifted referral now talking about promoting to next grade; it's still unclear how promoting to next grade and not recommending for gifted is low expectations... going to the next grade doesn't make someone gifted; after reading this over several times I figured the "conditional on test scores" part is the key. It wasn't obvious the first several times I read it though. (But then, I'm not gifted material.)

p.13 "coefficient on δ"... isn't δ the coefficient?

p.14... I thought I understood the names thing, but p.14 seems to say something different than p.6

p.14-15... actual model used to generate result in Table 3 is unclear

Out of Order -

p.13 "test these models with a linear probability specification"... just listed $(\text{Grade promotion})_{ift}$... is there a second model missing?... later on say "I therefore estimate variants of the preceding equation, using gifted placement..." (13); things just seem out of order

p.14 starts discussing dimensions of

Discussion on Asians and composition of teachers is nice touch, but it's not mentioned in the introduction so I was caught off guard

Other Comments

Missing - references section doesn't list Betts (1995)

Middle Names - should just be a footnote to keep the paper flowing smoothly

Clustering - "clustering at the student level"... does this mean family?

Black-White Test Score Gap - how big is the gap? this is probably known by someone studying this field, but it may be worth mentioning in the intro for other readers; it also helps emphasize (hopefully) that magnitude of the results

Measurement Error - p.22 says low socio-economic status names measured with error so actual share of test score gap explained by naming patters may be larger... couldn't the error mean it could also be smaller?

Follow On - how about other "uneducated" sounding names: Billy Bob, Buddy, Billy Ray, Bobby Lee, etc.

Comments from Class

Borders of economics and psychology

Test Gap - still get test score gaps between blacks and whites in same school so gap isn't just a school quality issue

Expectations - people have a way of living up to (or down to) expectations

Utility Theory - (economic explanation) work is the absence of leisure so it's a "bad" and people seek to maximize utility ("goods") $\therefore$ people will not work if they don't have to (unless there are benefits from the work)

Kids - have a discount rate that is basically 1 (i.e., tomorrow doesn't matter); they only care about grades because of the results (praise or rewards form parents)

Psychology Literature - during 1970s, several experiments on randomly assigning pictures to writing samples to get teacher assessments of student intelligence; got lower assessments for blacks

Economics Version - Bertrand & Mullainathan, "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination," *American Economics Review*, 2004; assigned racially identifiable names to identical resumes; fewer call backs for the black names

Family Characteristics - need to control for this to capture expectations; use lots of covariates or use siblings... but how do you get racial differences among siblings? Instead of focusing on black and white, the paper looks at signals (names)

Sibling Concerns - Sibling comparison sound great, but it's not a "silver bullet"...

- Names aren't randomly assigned
- Name can be a signal to the kid to not "act white"
- Siblings doesn't necessarily control for all background characteristics (e.g., parents could devote more/less resources to one kids)

Robust - this paper replicates sibling results by using twins

Blackness of Name - based on % black who have the name

History - late 1960s black intellectuals (high socio-economic status) started using African names (e.g., Latifa); later it got copied in lower socio-economic status and morphed into unique names that are African sounding (La'kisha)

Revealed Preference - "Economics, as a rule, don't believe what people say... They look at actions"; all teachers say they treat kids the same, but paper focuses on what teachers actually do to objectively define low expectations

Extension - look at **gender**; names are more concentrated for boys so expect unique names to have greater effect for boys; actually Figlio ran this and found the results are the same for boys and girls

A First Lesson in Econometrics

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A First Lesson in Econometrics

Every budding econometrician must learn early that it is never in good taste to express the sum of two quantities in the form:

$$1 + 1 = 2. \tag{1}$$

Any graduate student of economics is aware that

$$1 = \ln e, \tag{2}$$

and further that

$$1 = \sin^2 q + \cos^2 q. \tag{3}$$

In addition, it is obvious to the casual reader that

$$2 = \sum_{n=0}^{\infty} \frac{1}{2^n}. \tag{4}$$

Therefore equation (1) can be rewritten more scientifically as

$$\ln e + (\sin^2 q + \cos^2 q) = \sum_{n=0}^{\infty} \frac{1}{2^n}. \tag{5}$$

It is readily confirmed that

$$1 = \cosh p \sqrt{1 - \tanh^2 p}, \tag{6}$$

and since

$$e = \lim_{\delta \to \infty} \left(1 + \frac{1}{\delta}\right)^{\delta}, \tag{7}$$

equation (5) can be further simplified to read:

$$\ln\left[\lim_{\delta \to \infty} \left(1 + \frac{1}{\delta}\right)^{\delta}\right] + (\sin^2 q + \cos^2 q) = \sum_{n=0}^{\infty} \frac{\cosh p \sqrt{1 - \tanh^2 p}}{2^n}. \tag{8}$$

If we note that

$$0! = 1, \tag{9}$$

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and recall that the inverse of the transpose is the transpose of the inverse, we can unburden ourselves of the restriction to one-dimensional space by introducing the vector X, where

$$(X')^{-1} - (X^{-1})' = 0. \tag{10}$$

Combining equation (9) with equation (10) gives

$$[(X')^{-1} - (X^{-1})']! = 1, \tag{11}$$

which, when inserted into equation (8) reduces our expression to

$$\ln\left\{\lim_{\delta\to\infty}\left\{[(X')^{-1} - (X^{-1})'] + \frac{1}{\delta}\right\}\right\} + (\sin^2 q + \cos^2 q) = \sum_{n=0}^{\infty} \frac{\cosh p\sqrt{1 - \tanh^2 p}}{2^n}. \tag{12}$$

At this point it should be obvious that equation (12) is much clearer and more easily understood than equation (1). Other methods of a similar nature could be used to simplify equation (1), but these will become obvious once the young econometrician grasps the underlying principles.

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