Discussion of Durlauf, Navarro and Rivers
"Notes on the Econometric Analysis of Crime"

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Steve's ~~Advice~~ Complaints

1. ## Estimation: Start with well-specified choice models
   - → Understanding the aggregation of micro-behavior into macro aggregates can guide functional form choices
     - Ad hoc functional forms
   - → Well-specified models highlight important controls
     - Policy variables are often correlated (and too often omitted)

2. ## Interpretation: Policy analysis requires well-specified social welfare functions
   - → Requires explicit of counterfactual policy experiments
     - Counterfactuals rarely well-specified
   - → Statistical significance is not policy significance
     - Statistical significance is the usually reported
     - Cost-benefit relevant magnitudes rarely reported
   - → Probability distributions matter, not just mean effects
     - Model uncertainty is usually ignored
     - Model uncertainty may be large

What is Missing?

My Complaints

0. Poorly-defined policy counterfactuals

1. Incredible instrumental variables

2. Overstatements of precision

3. Publication bias understates model uncertainty

Complaint #0: Counterfactual Policy Analysis

❑ What is the relevant counterfactual policy in death penalty analysis?

1. Abolish the death penalty

   – Test of the "deterrence" hypothesis

2. Re-allocate all death penalty resources to other criminal justice areas

   – Cost-benefit analysis

3. Re-allocate "some" proportion of death penalty resources to alternative criminal justice projects and "the rest" to competing state priorities

   – The variation we have.
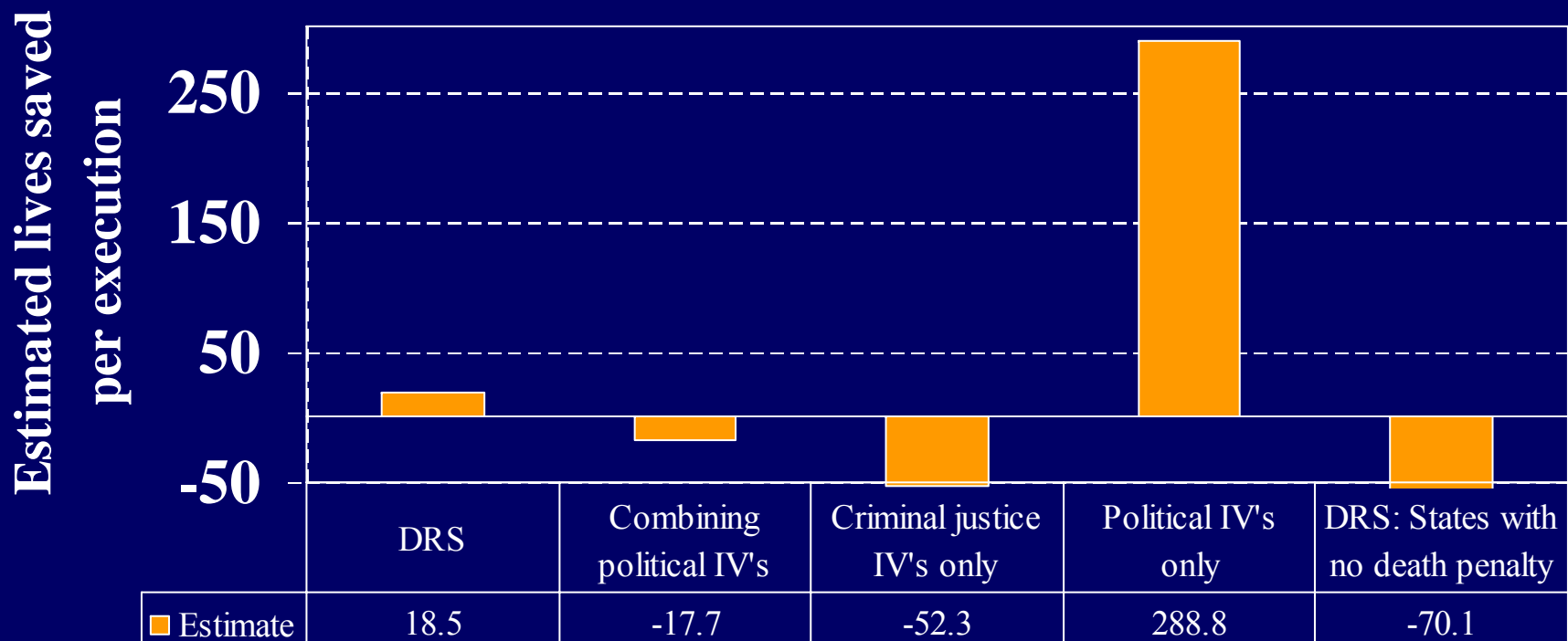
Complaint #1: Incredible Instrumental Variables

- ❑ Identification requires "experiments" in execution policy that do not otherwise affect crime
  - – DRS suggest "experiments" in execution from:
    - » State-level police payrolls
    - » State judicial spending
    - » Prison admissions
    - » Partisanship: % of state voting for a Republican Prez (6 variables)
  - – Further:
    - » Variables are state aggregates, not per capita
    - » Nominal, rather than real expenditure variables

An Instrument for All Occasions?

❑ The instruments used by Dezbakhsh, Rubin and Shepherd have been used in other papers:
  – Lott and Mustard (1997) ⇨ Explain concealed gun laws
  – Rubin and Dezbakhsh (2003) ⇨ Explain concealed gun laws
  – Shepherd (2002a) ⇨ Explain Truth-in-sentencing legislation
  – Shepherd (2002b) ⇨ Explain California's three strikes laws
  – Shepherd (2004) ⇨ Explain Sentencing guidelines

❑ In each case, the authors assume:
  – Instrumental variables cause changes in specific deterrence variables
  – But have _no other effects on crime_.
  – …and hence generate useful "as if" experiments in a particular endogenous variable (and not others!)

"Overidentification" Tests

Estimates of Lives Saved per Execution: Alternative "Experiments"

	DRS	Combining political IV's	Criminal justice IV's only	Political IV's only	DRS: States with no death penalty
■ Estimate	18.5	-17.7	-52.3	288.8	-70.1

(y-axis: Estimated lives saved per execution; scale: -50, 50, 150, 250)

Alternative IV Specifications

Assessing the Reduced-Form

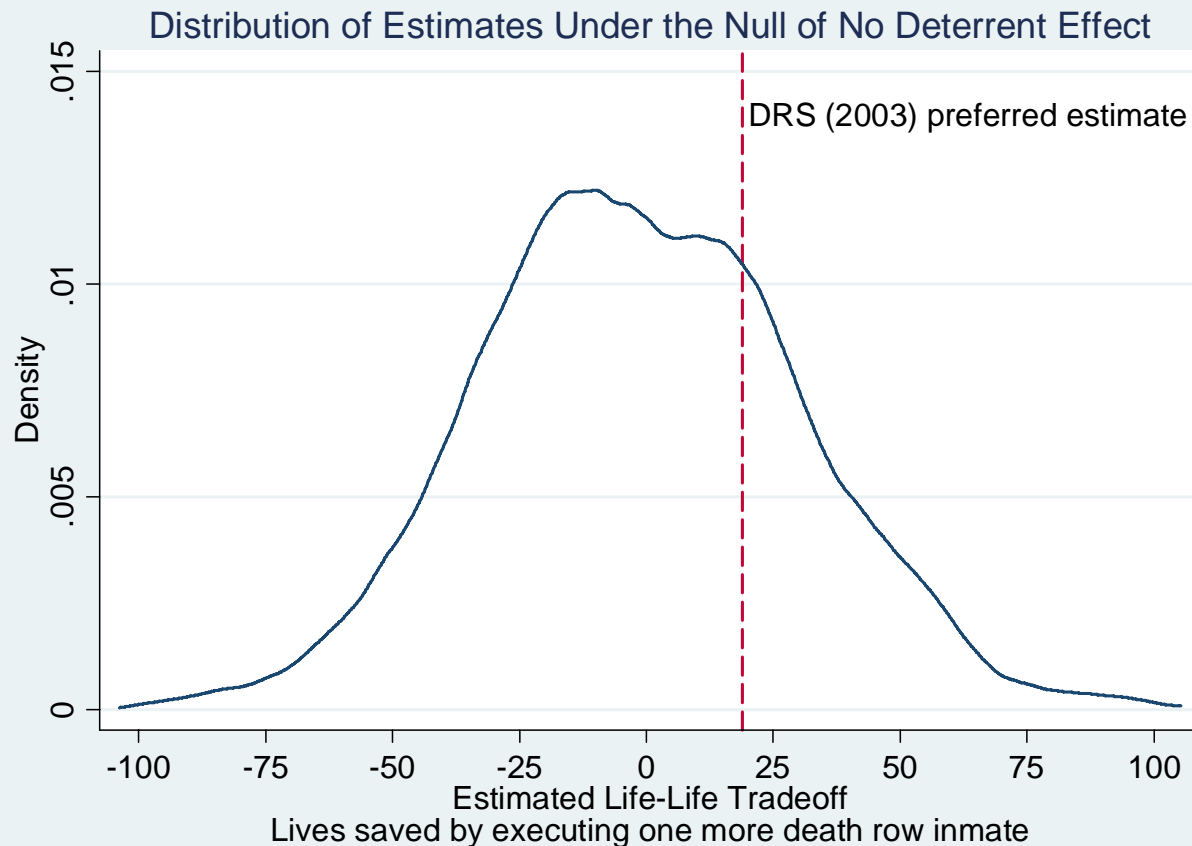|	Dependent variable			Net Effect on Homicide Rate[a]
	Probability of Arrest	Probability of Death Sentence Given Arrest	Probability of Execution Given Death Sentence	
	(1)	(2)	(3)	(4)
Police Spending	0.03 (0.023)	-0.002*** (0.000)	-0.05*** (0.004)	0.08
Judicial Spending	-0.22*** (0.034)	0.01*** (0.001)	-0.04*** (0.006)	0.58
Prison Admission	0.01*** (0.002)	-0.0001*** (0.000)	0.004*** (0.000)	-0.04
1976 * Republican Vote Share (Ford)	-0.66** (0.311)	0.03 (0.083)	0.49*** (0.053)	0.08
1980 * Republican Vote Share (Reagan I)	0.16 (0.202)	0.004 (0.004)	0.02 (0.036)	-0.45
1984 * Republican Vote Share (Reagan II)	-0.64*** (0.196)	0.04*** (0.004)	0.29*** (0.035)	0.54
1988 * Republican Vote Share (Bush I)	-0.25 (0.216)	0.06*** (0.004)	-0.03 (0.038)	0.41
1992 * Republican Vote Share (Bush II)	-0.04 (0.215)	0.05*** (0.004)	0.14*** (0.039)	-0.45
1996 * Republican Vote Share (Dole)	-0.82*** (0.212)	0.01** (0.004)	0.96*** (0.040)	-0.77
N	48,070	51,143	57,637	
	Second Stage			
Coefficients	-2.27*** (0.50)	-3.62 (14.53)	-2.71*** (0.62)	

Rubin's Response

❑ Donohue and Wolfers claim: These instrumental variables are not possibly "exogenous" shocks to execution policy

– Fail test of overidentification

❑ Rubin's response: "Most of our instrumental variables have been used in numerous empirical papers because previous researchers believed (often based on empirical testing) that the instruments were as uncorrelated with crime rates as one was likely to find."

– *Economists' Voice, April 2006* [Detail]

Complaint #2: Overstatements of Precision

❑ DRS treat county-year observations as independent
  – Variation in execution policy (IV's) at state level only
  – Autocorrelation in homicide and execution policy

Distribution of Estimates Under the Null of No Deterrent Effect

DRS (2003) preferred estimate

Density

Estimated Life-Life Tradeoff
Lives saved by executing one more death row inmate

❑ *Realistic estimates of parameter uncertainty make Durlauf et al's estimates of model uncertainty less striking*

Complaint #3: Publication Bias Understates Model Uncertainty

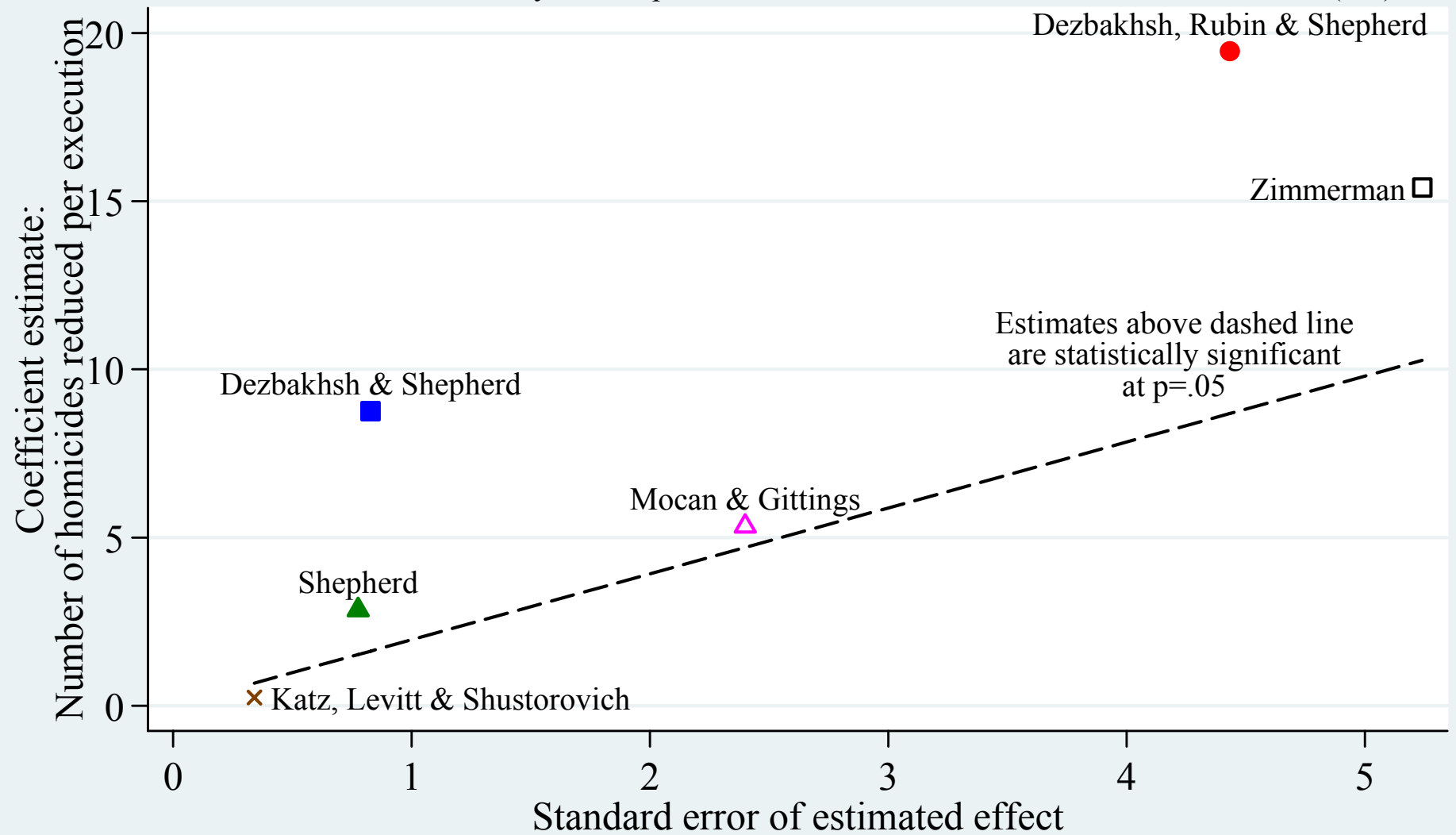Reporting Bias: Estimated Effects of Executions on Homicide

H0: No reporting bias implies that estimated effects should be unrelated to the standard error
H1: Results are more likely to be reported if the effect is at least twice the standard error (t>2)
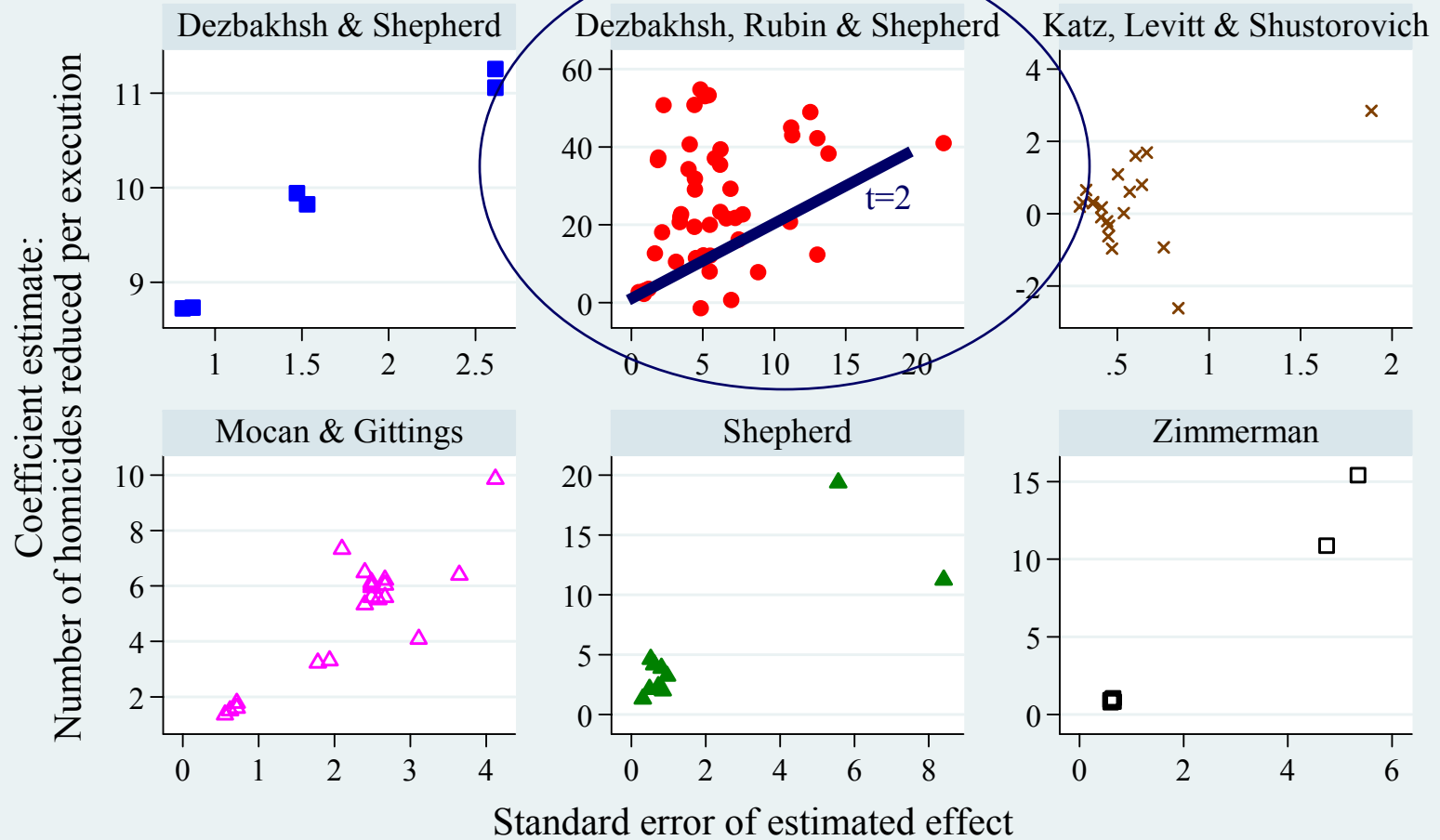
Coefficients converted into homicides reduced for the average executing state in 1996

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Dezbakhsh, Rubin & Shepherd

Zimmerman

Estimates above dashed line
are statistically significant
at p=.05

Dezbakhsh & Shepherd

Mocan & Gittings

Shepherd

Katz, Levitt & Shustorovich

Coefficient estimate:
Number of homicides reduced per execution

Standard error of estimated effect

Coefficients converted into homicides reduced for the average executing state in 1996.
The central estimate from each study is shown.
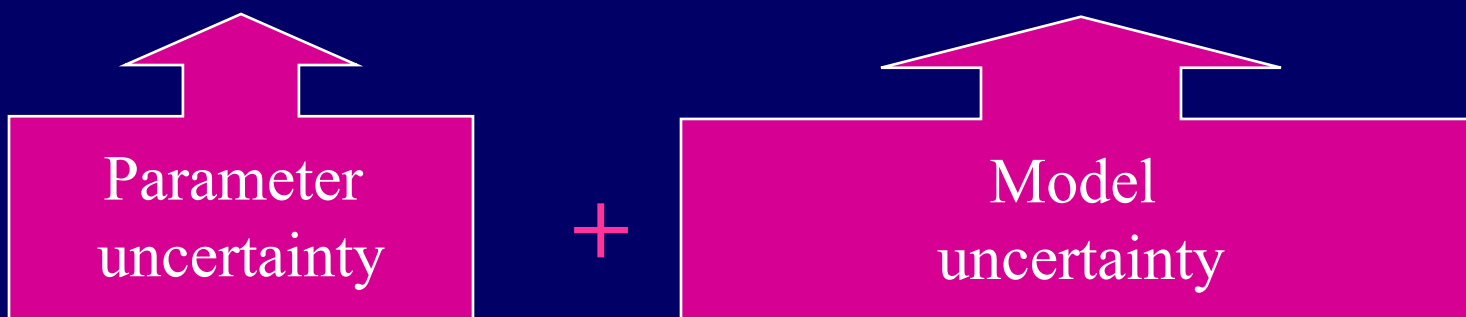
What Problem Does Model Averaging Solve?

❑ "Optimal" crime forecast

$$E\left(\rho_{l,t+1}\big|D_t,M\right) = \sum_{m \in M} E\left(\rho_{l,t+1}\big|D_t,m\right)P\left(m\big|D_t\right)$$

❑ Realistic measure of forecast uncertainty

$$Var\left(\rho_{l,t+1}\big|D_t,M\right) =$$

$$\sum_{m \in M} Var\left(\rho_{l,t+1}\big|D_t,m\right)P\left(m\big|D_t\right) + \sum_{m \in M}\left(E\left(\rho_{l,t+1}\big|D_t,M\right) - E\left(\rho_{t+1}\big|D_t,m\right)\right)^2 P\left(m\big|D_t\right).$$

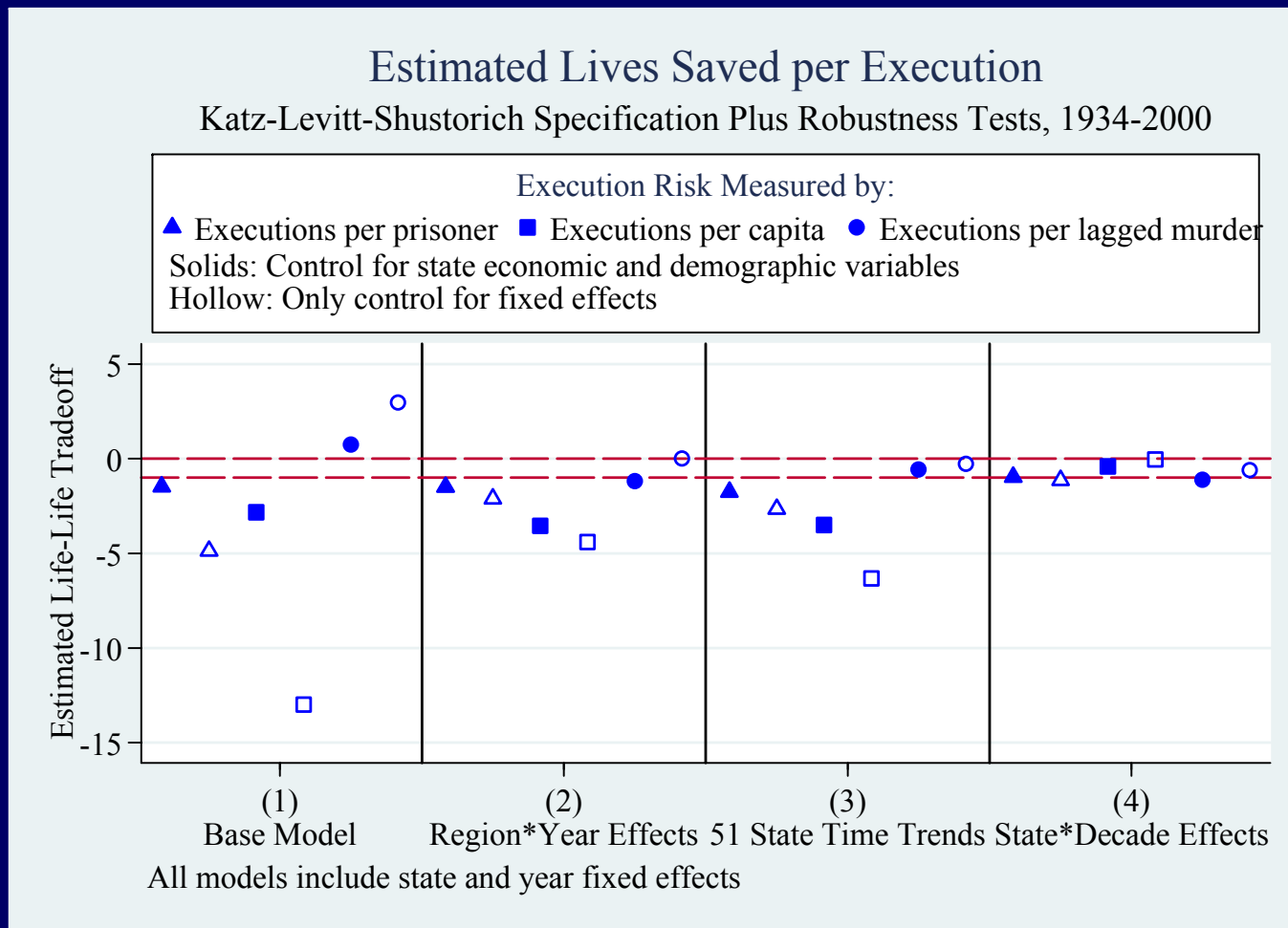Parameter
uncertainty

$+$

Model
uncertainty

$\rightarrow$ We get a reasonable measure of our ignorance

Which Models to Average?

❑ Durlauf et al: We should take a posterior weighted average of "coherent models"

❑ But in reality:

– Published models are a selected subset

  » Averaging pro-deterrence studies will yield pro-deterrence averages

– Some IV studies are not credible

  » GIGO: "Garbage in, Garbage out"

– Data cannot speak very precisely

  » Properly estimated, parameter uncertainty is huge

  » Model uncertainty also large

    ◆ But this depends on the range of "coherent" models

❑ What's missing?

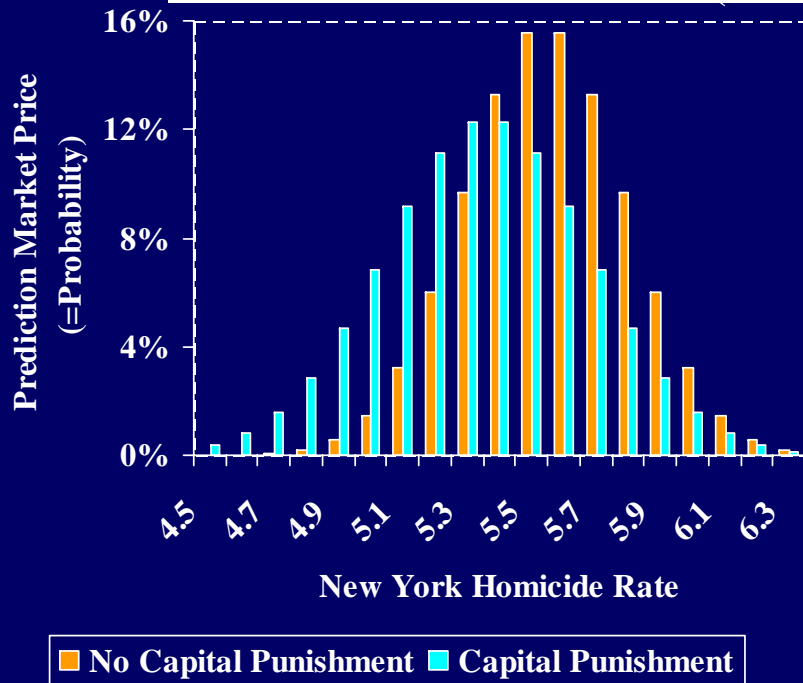– Researcher judgment

Katz, Levitt, Shustorovich: State Panel Data

Homicide rate$_{s,t}$ = β Execution rate$_{s,t}$ + State effects$_s$ + Year effects$_t$
+ Controls: prisoners per crime, prisoners per capita, prison death rates, real per capita income, %black, %age 02-24, %age 25-44, %urban
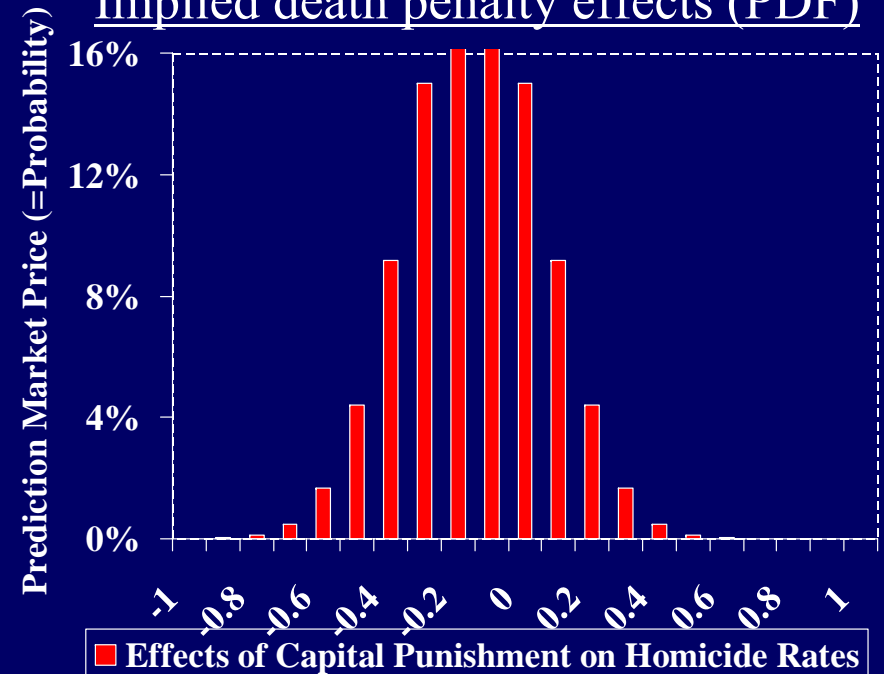*[+ region*year effects, state*time effects, or state*decade effects]*

Estimated Lives Saved per Execution
Katz-Levitt-Shustorich Specification Plus Robustness Tests, 1934-2000

Execution Risk Measured by:
▲ Executions per prisoner   ■ Executions per capita   ● Executions per lagged murder
Solids: Control for state economic and demographic variables
Hollow: Only control for fixed effects

Estimated Life-Life Tradeoff

(1) Base Model   (2) Region*Year Effects   (3) 51 State Time Trends   (4) State*Decade Effects
All models include state and year fixed effects

Model Averaging: A Market-Based Alternative

❑ Run a prediction market:
 – What will the New York homicide rate be in 2008?
  » If the Supreme Court allows executions to resume?
  » If executions are still deemed unconstitutional?

Predicted homicide rates (PDF)

Implied death penalty effects (PDF)

New York Homicide Rate

■ No Capital Punishment ■ Capital Punishment

■ Effects of Capital Punishment on Homicide Rates

Model Averaging: A Practical Alternative

Survey 100 clever social scientists.

❖ Sample begins:
- ❑ 1934 ❑ 1950 ❑ 1972 ❑ 1977 ❑ 1984 ❑ 2000

❖ Aggregation
- ❑ National time series ❑ State cross-section ❑ State-year panel
- ❑ State-month panel ❑ county-year panel ❑ OECD country-year panel

❖ Independent variable:
- ❑ #executions ❑ executions per death sentence$_{t-6}$ ❑ executions per murder
- ❑ executions per murder$_{t-1}$ ❑ executions per prisoner ❑ executions per capita

❖ Control variables:
- ❑ Age structure ❑ Racial composition ❑ Incarceration rate ❑ Prison conditions
- ❑ Police ❑ Arrest rate ❑ Death sentences per homicide$_{t-7}$ ❑ Non-homicide crime rates
- ❑ State effects ❑ Year effects ❑ State*year trends ❑ State*decade effects ❑ Region*year effects

❖ Estimation:
- ❑ OLS ❑ WLS ❑ GLS ❑ Median regression ❑ IV ❑ Matching (on what?)

❖ Instruments
- ❑ Supreme court decisions ❑ State supreme court decisions ❑ Legislative changes
- ❑ Police payrolls ❑ Prison admissions ❑ Judicial spending ❑ % voting Republican
- ❑ Botched executions ❑ Ratio of Black-white homicide rates

❖ Weight you put on this model?
- ❑ 5% ❑ 10% ❑ 20% ❑ 25% ❑ 50% ❑ 100%