The Production of Knowledge

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For more detail --

“The Production of Knowledge”
Oxford University Press, 2006

First part: Some methodological challenges
Second part: Some possible solutions
Both: Some of my experiences

Outline

- Axioms: What is knowledge? What is the social function of science?
- Central problems for the social sciences: Pretences of research
- Some steps toward improvement: The production of knowledge

What is knowledge?

- It's debatable.
- Dictionary:
  - (1) Practical know-how
  - (2) "Fact" or "truth"
- Knowledge is what people say it is.
  - Brunsson: consensus
    - For something to become a fact, people must agree that it has been demonstrated.
  - Implication: "Truth" depends on human perceptual capabilities and social processes.

What should and does science contribute?

- Science should be a legitimated source of authenticated knowledge.
  - Science needs to engender confidence.
  - Problem: Scientists both produce knowledge and authenticate it, which biases the evidence.
    - Mahoney found that reviewers use methodological judgments to mask substantive agreement or disagreement.

How well does science work?

- The effectiveness of scientific method is a hypothesis that has to be tested in practice.
  - The validity of this hypothesis depends on the situations in which people use scientific methods.
    - Do the situations make sense in current frameworks?
    - Effectiveness may differ in the physical and social sciences. Relevance of social construction.
  - The validity of this hypothesis depends on what people do to make scientific methods concrete.
- Often, scientific methods have not improved understanding of behavior or abilities to produce desired outcomes.

"We have met the enemy and he is us."

Pogo
(Walt Kelly)
1971

Pretences of research

- Never-ending ambiguity
  - Researchers do not agree about the existence and nature of knowledge.
- Unlimited productivity
  - Researchers solve easy problems rather than challenging ones.
- Comfortable knowledge
  - Researchers choose knowledge that fits human anatomy and human ambitions.

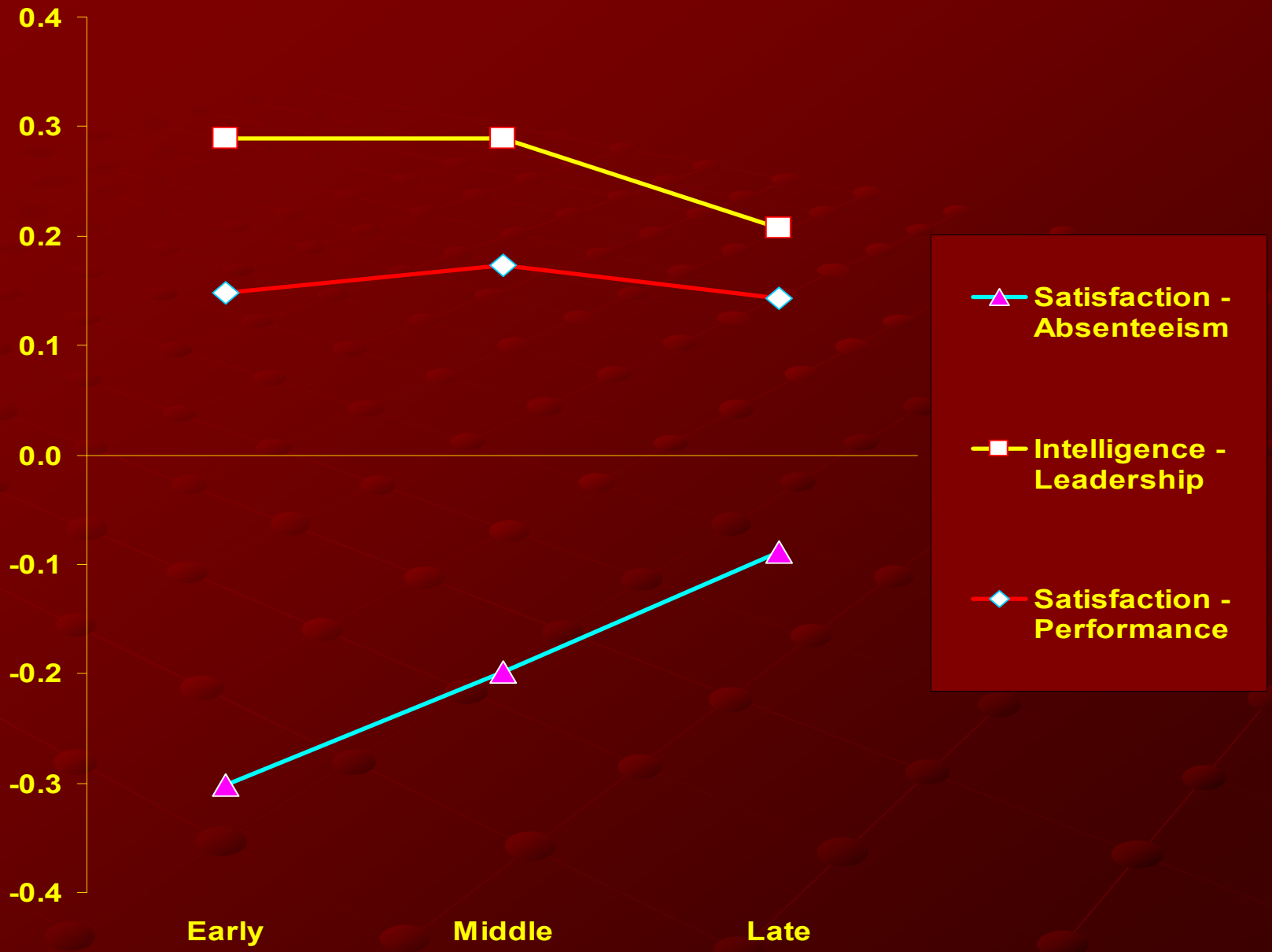
Never-ending ambiguity: Research does not produce closure.

- Empirical studies generally raise more questions than they answer.
  - Almost all studies point out deficiencies in their methodology.
  - Almost all studies call for more research to answer the questions they have not answered.
  - Indeed, most studies raise more questions than they answer.

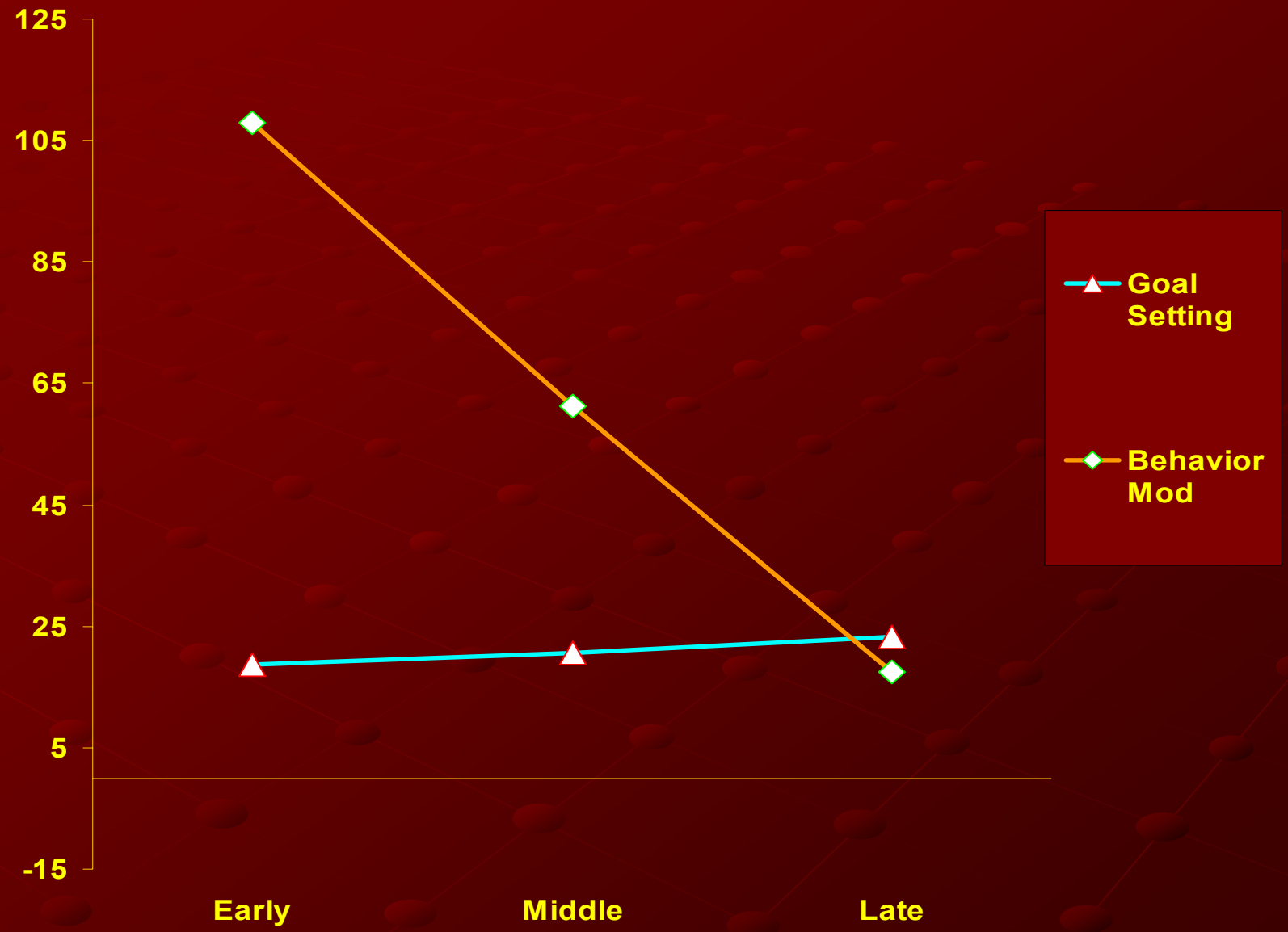
Knowledge may not be increasing over time.

- Studies of strategic planning and profitability explained less and less over time (Thune-House, 1970; Grinyer-Norburn, 1975).
  - Better measures of planning and profitability
  - More representative samples
  - Data gathered by methods that did not determine findings

Mean Correlations over Time



Percentage Improvements with Interventions over Time



Why does knowledge not accumulate?

- Researchers may cling to ineffective theories.
- Researchers may try to refine methods of data gathering that have limits in what they can do (e. g., questionnaires).
- High effect sizes may have idiosyncratic causes.
- Humans may be changing faster than knowledge is accumulating.

Never-ending ambiguity: People disagree about research value.

- Reviewing and publishing are very unreliable and biased.
  - Quality in management research is a political judgment.
- Study of reliability (Organization Science, 2005):
  - Uneven distributions and few categories reduce the reliability of evaluations.
  - Correlation of a reviewer's judgments with objective value is probably between 0.09 and 0.27.
  - The top 20% of journals publishes less than half of the best 20% of manuscripts.
    - This is also true at lower quality levels.
  - A few of the best 20% of manuscripts may be rejected by five consecutive journals at decreasing quality levels.

Unlimited productivity: Everyone can make significant discoveries.

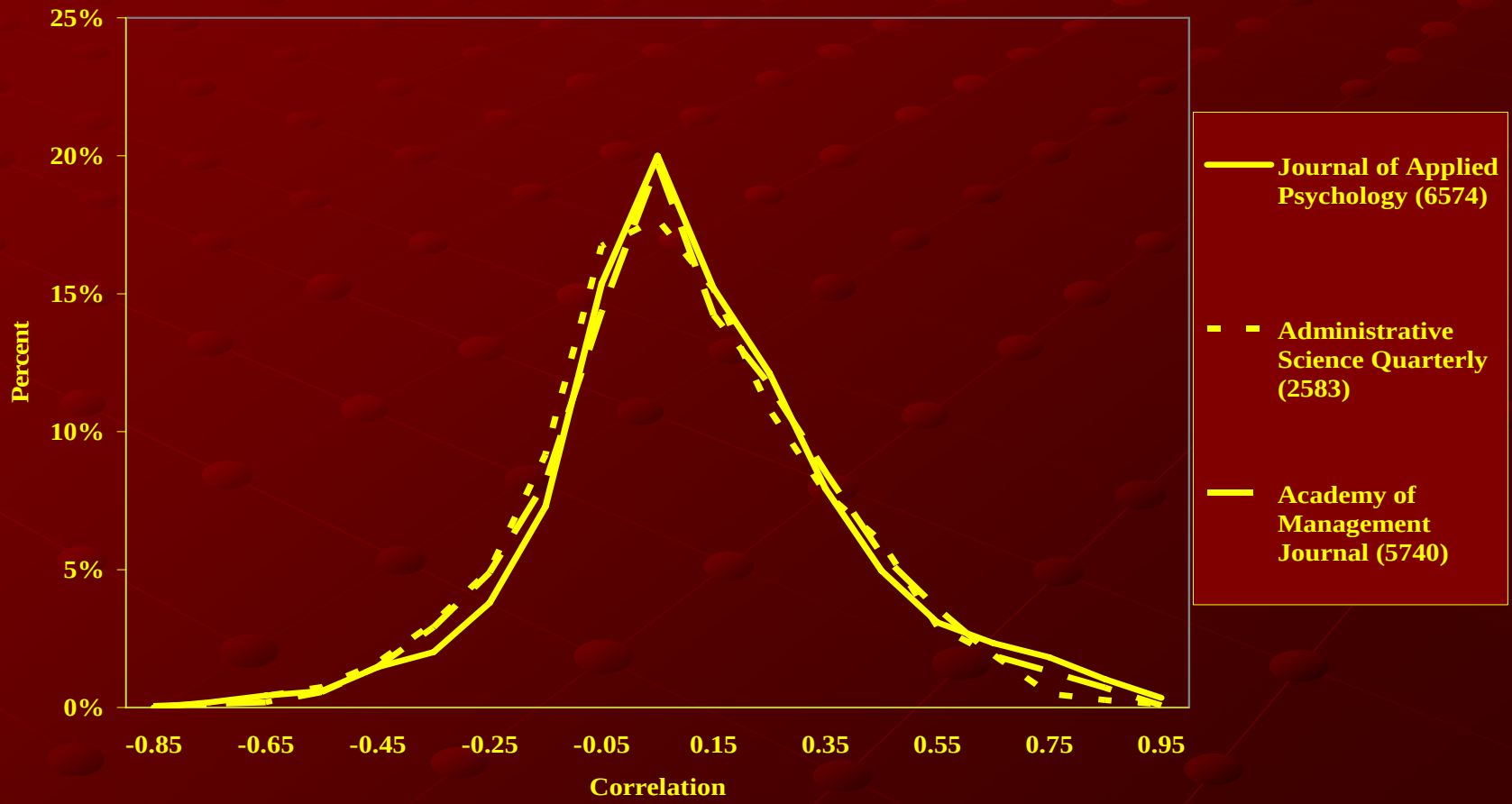
- This age believes in the industrialization and democratization of knowledge production.
- Reward systems encourage the production of papers rather than knowledge.
- Significance tests allow researchers to label any difference “significant”, including meaningless ones.

Point null hypotheses

- Point null hypotheses can ALWAYS be rejected if researchers collect more data.
  - $\mu 1 = \mu 2$
  - $\sigma 1 = \sigma 2$
  - $\rho = 0$
  - regression coefficient = 0
  - frequency = 0
- Statistical significance indicates that researchers are motivated to collect enough data.
- Thus, these tests tell about researchers as well as hypotheses. Should “truth” or “significance” depend on who collects data?

Significance tests are too easy.

Figure 6. Correlations Reported in Three Journals



14,900 correlations

(AMJ, ASQ, JAP; Webster and Starbuck, 1988)

- Ames and Reiter
- Median correlation = 0.09.
- Two-thirds of the correlations are positive.
- Choosing variables at random, probability is 0.67 of finding a significant correlation on the first try.
- Probability is 0.96 of finding a significant correlation in the first three tries.
- Mean correlation in samples <70 is twice that in samples >180.
  - Researchers adapt their data gathering to their findings.

Unlimited productivity: Everyone can create innovative theories.

- There are no widely accepted truths.
  - Several people can promulgate equivalent theories, portraying minor variations as major achievements.
    - Example: In 1980s, several leadership theories appeared that echo utility theory.
- Theoretical innovations are usually very simple propositions that reflect the simplicity of human cognition but possibly not the complexity of studied phenomena.
  - Example: Almost all propositions in the *Academy of Management Review* describe linear relations between two variables.

Comfortable knowledge: Knowledge reflects human biases.

- Research often reveals more about the researchers and their assumptions than about the topics studied.
- Rationality . . . as human anatomy defines it –
  - Superficially sharp conclusions (significance tests)
  - Binary logic (true-false)
  - Simple explanations (two or three variables at a time)

Comfortable knowledge: Researchers attack easy targets.

- Retrospective analyses of spontaneous data
  - Researchers know in advance what they have to explain.
  - Many data may concern superficial facades that give an appearance of stability because they do not matter.
    - Organization charts, formal structures
    - Aston studies
- Pretentious names for variables create the appearance of valuable insight when the actual relationships are trite.
    - Aston studies

Comfortable knowledge: People take data at face value.

- Researchers ignore the high error rates in public databases.
  - 20–30% in Compustat and CRISP
- The accuracy of managers' perceptions
  - 5/8ths of managers have perceptions with error > 50%; average error = 200%.
  - Much research is based on interviews with managers or on questionnaires filled out by managers (or their secretaries).
    - This includes government statistics.

Most “informants” are uninformed.

- Interviews with managers and questionnaires completed by managers are likely to give managerial folklore.
  - Example: Lawrence and Lorsch and the idea that firms are more profitable if their structures fit their environments.
- Likewise, interviews with employees or questionnaires completed by employees are likely to give employee folklore.

Comfortable knowledge: Researchers use language to enhance their products.

- Language alters observations.
  - "The" instead of plurals fabricates generalizations.
    - "the role of institutional factors in the economic process" – one role, one process
    - "the work unit is the smallest collective group in the organization" – all organizations
  - Routine over-generalization:
    - Saying 'people are X' on the basis of an average or a correlation

The production of knowledge

- Disturbing oneself
  - Interrupting complacency and loosening logic
- Disturbing one's environment
  - Observing exceptional cases
  - Attempting to design, to change
- Emphasizing robustness
  - Making knowledge more dependable
  - Comparing with naïve models
  - Computing robust statistics
- Building consensus
  - Research as marketing
  - Building consensus about what we know

We should distrust our brains (reprise).

- In 1967, I deceived myself in Baltimore.
  - Rationality poses dangers.
- What makes human brains comfortable
  - Sharp conclusions and binary logic (true-false)
  - Simple explanations (two or three variables at a time)
- Properties that appeal to human brains may not be prevalent in the phenomena that humans want to understand.

Disturbing oneself

- Try to protect against self-deception, to interrupt complacency, and to loosen logic.
- Some ways to stimulate dialectical thinking.
  - The converse of every proposition is equally valid.
  - All causal arrows have two heads.
  - Teamwork can stimulate dialectic thought.
    - Colleagues who disagree are both right.
    - All dissents have some validity.
- Triangulate (Sutton and Rafaeli, 1988).
- Strong inference (Platt, 1964) – Getting rid of bad hypotheses is more valuable.
    - But strong inference is risky!

We should distrust our environments

- Spontaneous data are politically biased
  - Revolution in the Free University
  - Management before 0 A.D.
- Because of autocorrelation, historical data may be very unrepresentative of the processes that generate them.
  - To distinguish between very simple causal processes, Wold (1965) needed 500 replications of series having 200 observations.

Disturbing one's environment

- The most important causal relations are rarely apparent in equilibria.
- To protect against the biases in spontaneous data –
  - study natural experiments,
  - study exceptional cases, and
  - attempt to predict changes and produce them.

An engineering perspective

- Electrical engineering considers what one can learn about the contents of a blackbox.
  - Studies of changes give more information and reveal different processes at work than do studies of equilibria.
- Dearborn's dictum: "If you want to understand something, try to change it."

Should you ask the environment to help?

- The Marketing Science Institute
  - Better questions
  - Better analysis before gathering data
  - Better data
  - Better analysis of implications
- Collaborations between academics and practitioners depend on their mutually inconsistent goals.
  - Short-run, specific versus long-run, general

Two lessons from forecasting

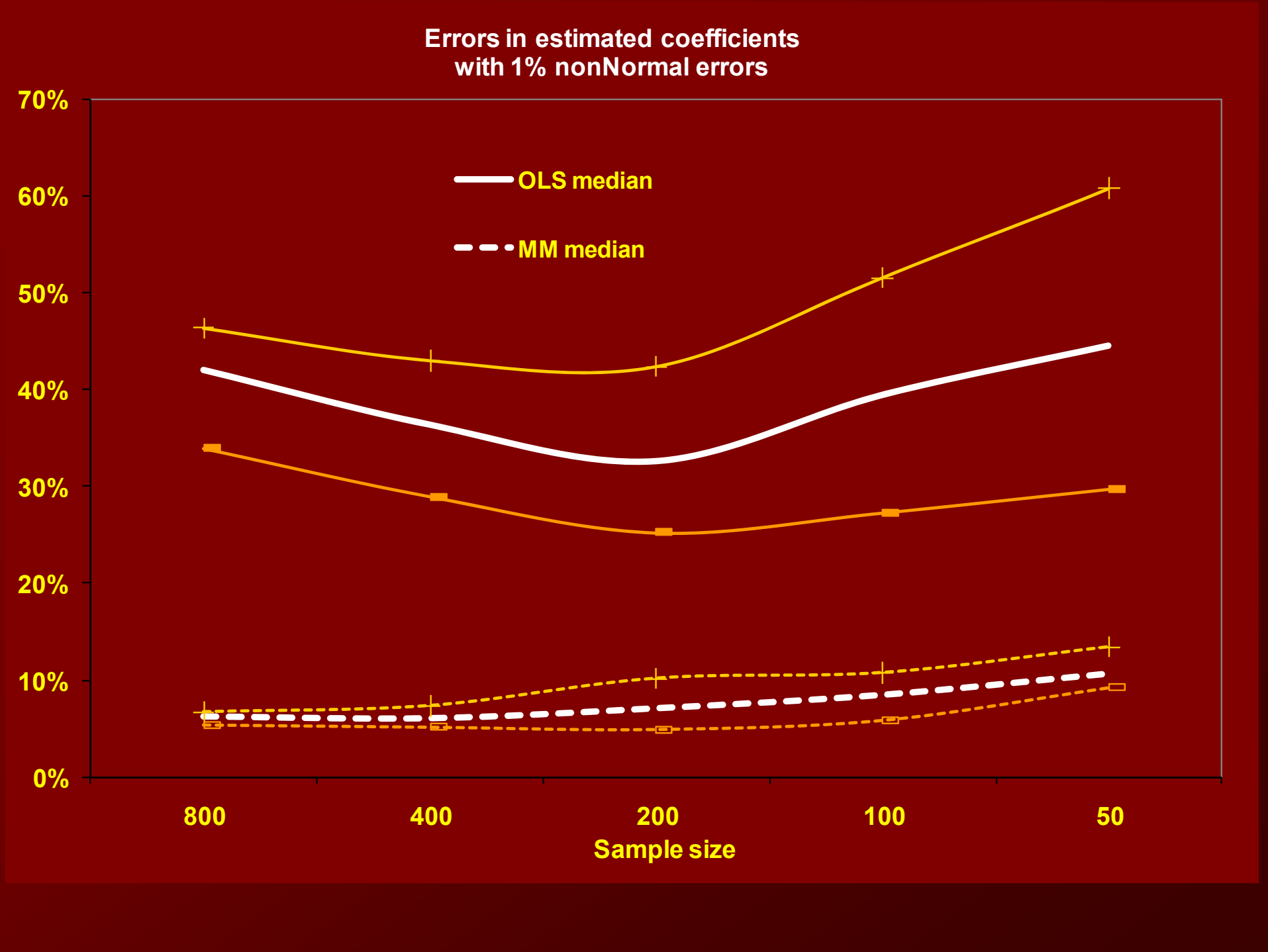
- Complex, subtle, or elegant techniques give no greater accuracy than simple, crude, or naïve ones.
  - Complex methods mistake noise for information, so more complex methods rarely yield promised gains.
- Least-squares regression produces unreliable findings.
  - If researchers use squared errors to measure fits to historical data and forecasting accuracies, better fitting models do not predict better, even in the very short run.

Emphasizing robustness

- To protect against meaningless "findings" that reflect random noise, use more robust statistical methods.
- Compare your hypotheses with naïve models rather than null hypotheses.
- Eschew squared-error statistics.
- Use robust statistics, e. g., robust regression.

Average absolute percentage error in estimated coefficients with moderately noisy data

Ordinary Least Squares regression (OLS)	67.8%
Absolute-error regression (L1)	25.3%
Least Median Squares regression (LMS)	12.9%
Least Trimmed Squares regression (LTS) with 90% of the data	9.9%
Robust MM regression	8.2%


Errors in estimated coefficients
with 1% nonNormal errors
70%
60%
50%
40%
30%
20%
10%
0%
OLS median
MM median
800
400
200
100
50
Sample size

Building consensus

- To help knowledge accumulate, work to stabilize it.
- Undermine the imputed social status of journals.
  - Status hierarchies are largely unjustified by quality differences.
- Try to build consensus about what we know.
  - There should be baseline “truths.”
  - Kerr’s Law: Journals should refuse to publish findings that contradict or repeat baseline truths.

Building consensus

- Recognize that publication requires marketing
  - What's interesting? (Murray Davis, 1971)
- Water in Merida
  - The acceptance of ideas depends on framing.