Freakonomics: Putting science back into the social sciences

LAURA ARGYS
DEPARTMENT OF ECONOMICS
UNIVERSITY OF COLORADO DENVER
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Social Sciences – a definition

“the scientific study of society”  Collins English Dictionary

“a branch of science that deals with the institutions and functioning of human society and with the interpersonal relationships of individuals as members of society”  Merriam-Webster dictionary

“the study of how groups of people behave, often in an effort to predict how they will behave in the future”  Dictionary.com
... and what is included

Economics
Political Science
Sociology

Human geography
Social psychology
Anthropology
Communication
History
Law
Philosophy
What characterizes economics?

Understanding how people consider the (opportunity) costs and benefits in making decisions.

Developing mathematical models to predict individual and group behavior.

Careful use of data and statistical methods focused on causality to understand the behavioral impact of changing circumstances and policies.
Economics is above all a science of measurement. It comprises an extraordinarily powerful and flexible set of tools that can reliably assess a thicket of information to determine the effect of one factor, or even the whole effect. That’s what the ‘economy’ is, after all; a thicket of information about jobs and real estate and banking and investment. But the tools of economics can be just as easily applied to subject that are -- well, more interesting. (Levitt and Dubner P. 13)
1. Incentives are the cornerstone of modern life
2. Knowing what to measure and how to measure it can make a complicated world less so.
3. The conventional wisdom is often wrong.
4. Correlation does not equal causality.
Correlation does not equal causality

When two things travel together it is tempting to assume that one thing causes the other. Married people, for instance are demonstrably happier than single people; does this mean that marriage causes happiness? Not necessarily.
(Think Like a Freak -- Levitt and Dubner P 16.)

1. People who will be happy when married are the people who choose to get married. (Sample selection bias)

2. Marriage doesn’t cause happiness, happiness causes marriage. (Reverse causality)

3. Marriage and happiness are unrelated; but wealth leads to marriage and wealth leads to happiness. (Omitted variable bias)
“Peer effects” in health, education, and work.

Who is a ‘peer’?
◦ The people around you, whose characteristics and behavior you can observe.
◦ Classmates; Roommates; Friends; Siblings/family members; Co-workers;

What is a ‘peer effect’?
◦ When the characteristic or behavior of those around you affect your behavior (behaviors are positively correlated.)

Why a peer effect? Is there an incentive to behave like a peer? Does it alter costs or benefits?
In “Think Like a Freak”, a field experiment of hanging four signs on a door to encourage energy conservation included:

Protect the Environment; Do your Part for Future Generations; Save Money; Your Neighbors are Doing it.
Can’t we just observe that peers behave alike?

Students in high-ability classes perform better
- Parents who seek out advanced classes provide educational environment
- Did the class cause the scores or the scores cause the class?
- Are there other characteristics of the class that enhance student performance?

Adolescents who smoke most likely have friends who smoke.
- Kids who have rebellious/risk-taking personalities become friends.
- Did the friends cause the smoking or did smoking cause the friends?
- Do they live in a community where smoking is commonplace?

- Sample selection; reverse causality; common shocks;
What we’d like to do is conduct a scientific experiment.

Select two samples of adolescents who are identical (age, sex, income, parents education or smoking status).

Assign some of them to a class with high-performing peers or assign some of them friends who smoke and others non-smoking friends.

Make sure that they have the same experiences (quality of teacher; same curriculum) (anti smoking messages in school, smoking rules on their campus, availability of cigarettes)

Compare outcomes.
The best of all possible worlds.... in the social sciences.

Treatment is selected at random  (the groups you are comparing are identical except for the smoking behavior of peers).

All other variables are controlled.

Outcomes are measurable.
What is the social science equivalent?

**Lab experiment** – the researcher controls the choices, other factors and other participants to mimic ‘the real world’.

**Field experiment** – run an experiment in the real world. Control what you can – at least the participants are making real decisions and they may not know that they are part of an experiment.

**Natural experiment** -- the researcher has no control over the choices or conditions – but by nature or institutions, a dramatic change occurs that affects only segments of the population (preferably at random).

- Instrumental variables
- Difference-in-differences
- Regression discontinuity models
Begin with educational outcomes: K -12

Difficulty is that parents choose schools (parents who invest in their children will choose ‘good’ schools). And get their children into ‘good’ classes. Or teachers and schools sort children into ability-based classes. How to get random (or non-choice-based) peers?

Natural Experiments!

First experiment: Chinese middle schools randomly assigned.

Carmen and Zhang, 2012
Random assignment: Chinese Middle School (Carmen and Zhang, 2012)

Effect of Random Assignment to High Achieving Peers

- Math Score
- English Score
- Chinese Score
Natural Experiment: Busing

Busing in Wake County, North Carolina (Hoxby and Weingarth, 2005)
- Initially based on race; later based on income;
- Compare outcomes based on changes in peer mean achievement
  - (Linear-in-Means/Bad Apple/Shining Light/Boutique model)
- A 1 point increase in mean peer test scores increases own score by .25-.35
Instrumental Variables: Tracking (Boutique classes)

(Argys, Rees and Brewer, 1996); Assignment into school tracks;
◦ Low ability track
◦ Mid-ability track
◦ High-ability track

VS
◦ Heterogeneous class

Can we just observe the differences? No – parents/teachers may choose classes.

Instrument for tracking is school size.

Outcome: test scores
The Effect of Ability Grouping on Test Scores
Grade 10

- Above Average vs. Heterogeneous
- Average vs. Heterogeneous
- Below Average vs. Heterogeneous
Peer Effects in Higher Education

How do we find randomly (exogenously) assigned peers in college?

Roommate Assignment! Almost randomly assigned. Information regarding application ACT/SAT, hs GPA, major, and in a few cases, alcohol and tobacco use.

- Dartmouth (Sacerdote, 2001) small effects
- Williams College (Zimmerman, 2003) small effects
- University of Maryland (Foster, 2005) small effects
- Berea College (Kentucky/Appalachian) positive effects (Stinebrickner and Stinebrickner, 2006)
  - Roommate hs GPA and ACT on grades-- females
Maybe not just roommates?

Larger peer groups in higher education

Squadrons?  Air Force Academy in Colorado Springs  (Carrell, Fullerton and West, 2009)

Groups of 32 cadets that formed a tightly controlled social network– attended similar classes with identical syllabi and common exams.  Random sorting by sex; race and ethnicity; attending a military high school.

A one standard deviation increase in squadron hs GPA led to a .05 individual GPA increase.  Largest effects in Math and Science.

2.5 times larger than effects at Williams College.
Peer Effects – Risky Behaviors

**Friends Who Smoke** - kids with three or more friends who smoke are ten times more likely to smoke than kids whose friends don’t smoke. Make it a point to know who your kid’s friends are. ([www.raisesmokefreekids.com](http://www.raisesmokefreekids.com))

Friends are endogenous –

can we find random exposure to peers?
Birth Order as a Natural Experiment

Argys, Rees, Averett and Witoonchart, (2006)

- Because some risky behaviors typically increase with age during adolescence, we examine ‘random’ exposure to older peers

- Older siblings – within a family of a particular size, birth-order is random.

- Does exposure to older siblings increase risky behaviors among younger siblings?
Risky Behaviors increase with age

Figure 1. Marijuana Use by Age and Gender

\[ \beta = 0.031 \text{ (p-value < 0.001)} \]

Figure 2. Alcohol Use by Age and Gender

\[ \beta = 0.079 \text{ (p-value < 0.001)} \]
Risky Behaviors increase with age.... Does exposure to older siblings matter?

**Figure 3. Smoking by Age and Gender**

\[ \beta = 0.056 \text{ (p-value < 0.001)} * \]

**Figure 4. Sexual Activity by Age and Gender**

\[ \beta = 0.130 \text{ (p-value < 0.001)} * \]
Figure 1: The effect of an older sibling on substance use and sexual behavior
Some Risky Behaviors don’t Increase with Age
Figure 2: The effect of an older sibling on criminal and delinquent activities

![Graph showing the effect of an older sibling on different activities]

- Assault
- Gang
- Hand gun
- Vandalism
- Stealing

Comparison between:
- No older sibling (Boys)
- Has older sibling (Boys)
- No older sibling (Girls)
- Has older sibling (Girls)
Another Natural Experiment Exposing Adolescents to Older Peers – Age of School Peers

Natural Experiment (Argys and Rees, 2008)

There is variation across states in the dates/ages at which children may begin kindergarten (shown in the following table).

Combined with natural variation in birthdates throughout the year, children are ‘randomly’ placed into classrooms with relatively older or younger children.

Does exposure to older peers in your classroom increase the likelihood of engaging in risky behaviors (that increase with age)?
Table 1. Kindergarten Start Dates by State, 1985-1989

<table>
<thead>
<tr>
<th>States</th>
<th>Date by Which Child Must Be 5 to Enter Kindergarten</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota, Washington</td>
<td>August 31</td>
</tr>
<tr>
<td>Arizona, Florida, Georgia, Kansas, Massachusetts, Minnesota, Mississippi, New Mexico, Oklahoma, South Dakota, Texas, Utah, Wisconsin, West Virginia</td>
<td>September 1</td>
</tr>
<tr>
<td>Missouri (1985 –86 school year)</td>
<td>September 1</td>
</tr>
<tr>
<td>(1986 –87 school year)</td>
<td>August 1</td>
</tr>
<tr>
<td>(1987-88 through 1989-90 school years)</td>
<td>July 1</td>
</tr>
<tr>
<td>Montana</td>
<td>September 10</td>
</tr>
<tr>
<td>Iowa, Wyoming</td>
<td>September 15</td>
</tr>
<tr>
<td>Nevada, Ohio, Tennessee, Virginia</td>
<td>September 30</td>
</tr>
<tr>
<td>Alabama, Arkansas, Kentucky</td>
<td>October 1</td>
</tr>
<tr>
<td>Idaho, Maine, Nebraska</td>
<td>October 15</td>
</tr>
<tr>
<td>North Carolina</td>
<td>October 16</td>
</tr>
<tr>
<td>South Carolina</td>
<td>November 1</td>
</tr>
<tr>
<td>Illinois (1985-86 through 1986-87 school years)</td>
<td>November 1</td>
</tr>
<tr>
<td>(1987-88 school year)</td>
<td>October 1</td>
</tr>
<tr>
<td>(1988-89 school year)</td>
<td>September 1</td>
</tr>
<tr>
<td>Alaska</td>
<td>November 2</td>
</tr>
<tr>
<td>Oregon (1985-86 school year)</td>
<td>November 15</td>
</tr>
<tr>
<td>(1986-87 through 1989-90 school years)</td>
<td>September 1</td>
</tr>
<tr>
<td>California, Michigan, New York</td>
<td>December 1</td>
</tr>
<tr>
<td>Hawaii, Maryland, Rhode Island, Washington DC</td>
<td>December 31</td>
</tr>
<tr>
<td>Connecticut, Delaware</td>
<td>January 1</td>
</tr>
</tbody>
</table>
Finding Peer Effects: A Test of the Contagion Hypothesis

![Effect of having older peers – Girls](image)
Risky Behaviors in College too.

Roommate studies also used to investigate risky behaviors.

Roommates assigned by lottery at Northwestern University (Kremer and Levy, 2009)
- Roommates prior drinking is associated with lower GPA and increased drinking – predominately for males.

Fraternities -- Fraternity membership by a roommate increases fraternity membership and drinking among males at Dartmouth.
Peers and Work Productivity

Quasi-random co-worker assignment:

1. Grocery store clerks (Mas and Moretti, 2008)
   - Grocery store checkout clerks are assigned to registers at random.
   - Data from scanners suggests that working near a faster clerk increases scanning speed.
   - A 10% increase in peer’s speed increases worker productivity by 1.7%

2. Fruit pickers (Bandiera, Barankay and Rasul, 2008)
   - A large number of fruit pickers all working an orchard within sight of each other.
   - More closely match the pace of a nearby co-worker if there is a social relationship.
   - A somewhat unexpected result in a pay-for-performance (piece-rate) job.
Golfers are initially grouped at random—within category and tournament.

- Peer ability is measured by (a modified version of) a golfer’s handicap.
- Individual performance is measured as the difference between performance that day and the player’s usual performance.
- Very large payoffs for making the cut and particularly low scores.

- Conclusion: Money trumps peer pressure! No effect of pairings on performance.
“Laboratory Experiment” at work (Falk and Ichino, 2006)
Clean Evidence on Peer Effects

Controlled Field Experiment in Switzerland
Randomly Selected Subjects
Paid independently of their work output -- Stuffing envelopes
Worked in pairs (in sight of each other) and alone

Findings:
Strong evidence of positive peer effects in the pair treatment
Higher productivity in the pair treatment
Patterns in Peer Effects?

Educational peer effects are stronger at earlier ages
Ability grouping benefits higher ability students. (May or may not benefit lower ability students.)
College peer effects are more pronounced for risky behaviors than for educational outcomes
Peer effects in a work setting may be effective, but can be offset by productivity-based compensation.
<table>
<thead>
<tr>
<th>Date</th>
<th>Title of Event</th>
<th>Speaker(s)</th>
<th>Departments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER 4</td>
<td>Criminalizing Homelessness: Good Social Policy?</td>
<td>Tony Robinson, Ph.D.</td>
<td>Department of Political Science</td>
</tr>
<tr>
<td>OCTOBER 11</td>
<td>The Limits of Logic in Politics</td>
<td>Mark Bauer, Ph.D.</td>
<td>Department of Philosophy</td>
</tr>
<tr>
<td>OCTOBER 18</td>
<td>Immigration - Past Experiences, Present Concerns and Future Directions</td>
<td>Kariann Yokota, Ph.D.</td>
<td>Department of History</td>
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<tr>
<td>OCTOBER 25</td>
<td>Disaster Geography</td>
<td>Deb Thomas, Ph.D.</td>
<td>Department of Geography and Environmental Sciences</td>
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<td>NOVEMBER 1</td>
<td>Using Behavioral Economics to Promote Health</td>
<td>Meng Li, Ph.D.</td>
<td>Department of Health and Behavioral Sciences</td>
</tr>
<tr>
<td>NOVEMBER 8</td>
<td>Social Justice in the City</td>
<td>Jordan Hill, Ph.D.</td>
<td>Social Justice Program, Master of Humanities/Master of Social Science Program</td>
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<tr>
<td>NOVEMBER 15</td>
<td>The United States and its Relationship with Health Insurance: It’s Complicated</td>
<td>Andrew Friedson, Ph.D.</td>
<td>Department of Economics</td>
</tr>
</tbody>
</table>
References – Levitt and Dubner


References


