

# SoDA 496

# Introduction

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1/11/23

# Three Big Ideas

1. Data generating processes can be modeled.
2. There are intrinsic limits to what can be inferred from a model.
3. Your ideas are only as good as your marketing.

Why?

Why is this important?

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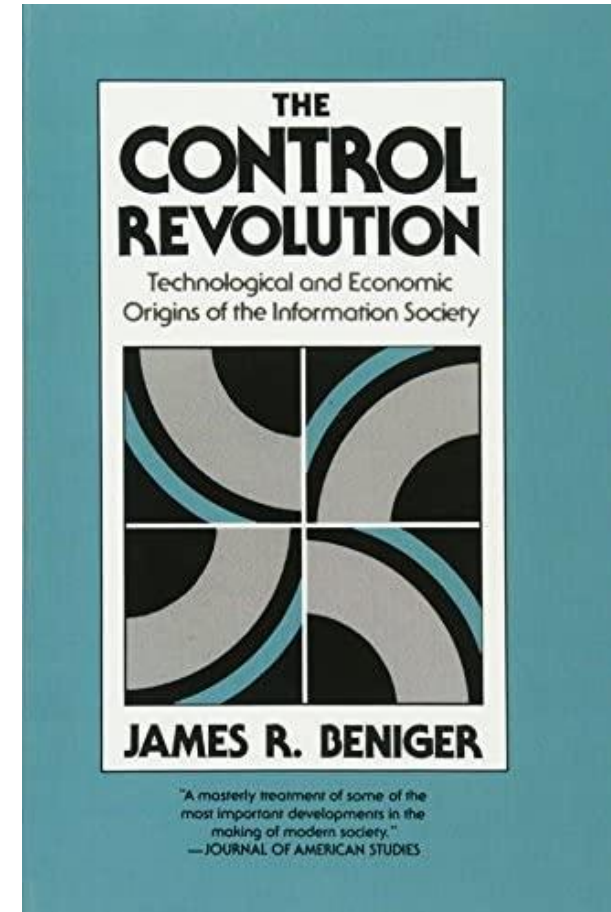
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- Why does this matter for society?
- Why does this matter for science?

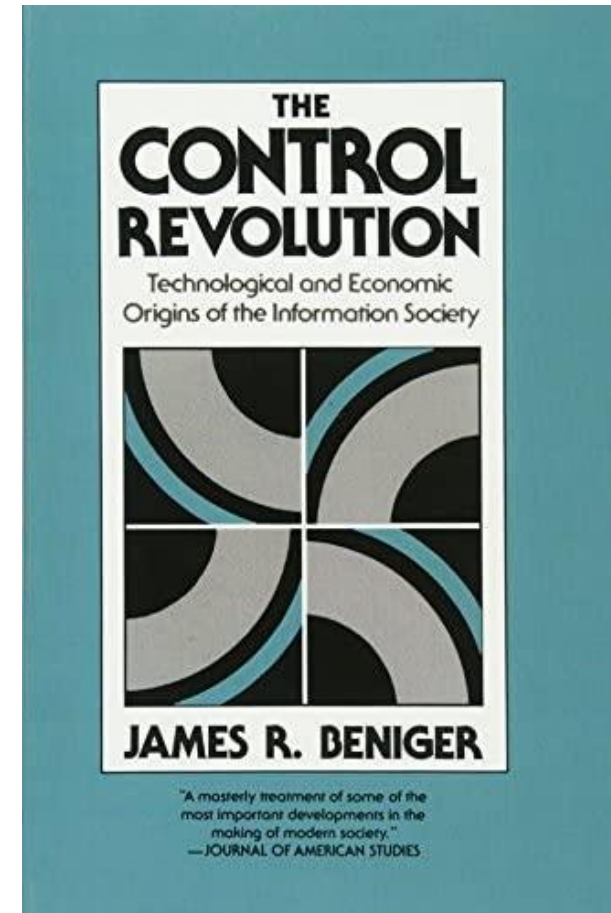
# The Control Revolution

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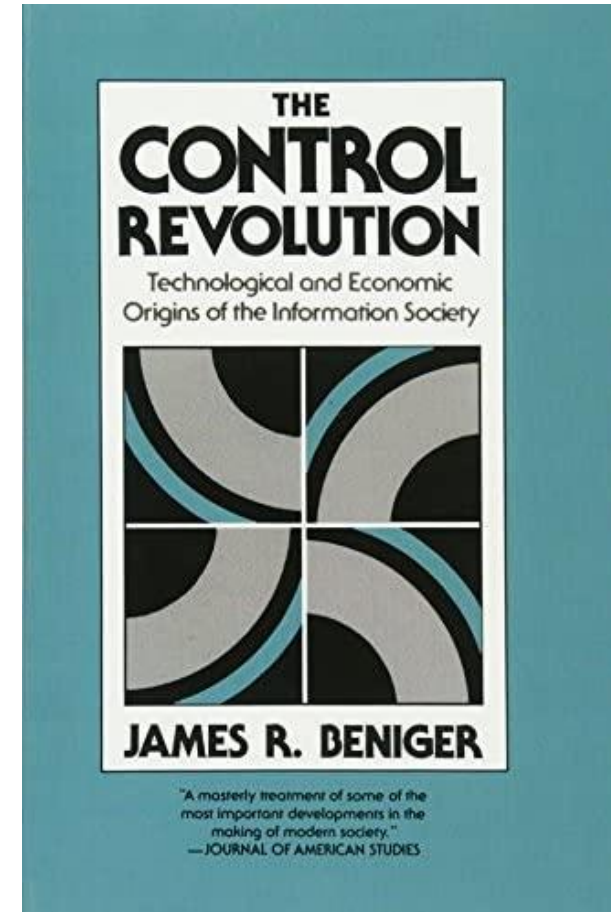
- The industrial revolution created a “crisis of control.”
- **Control:** Purposeful influence toward a predetermined goal.





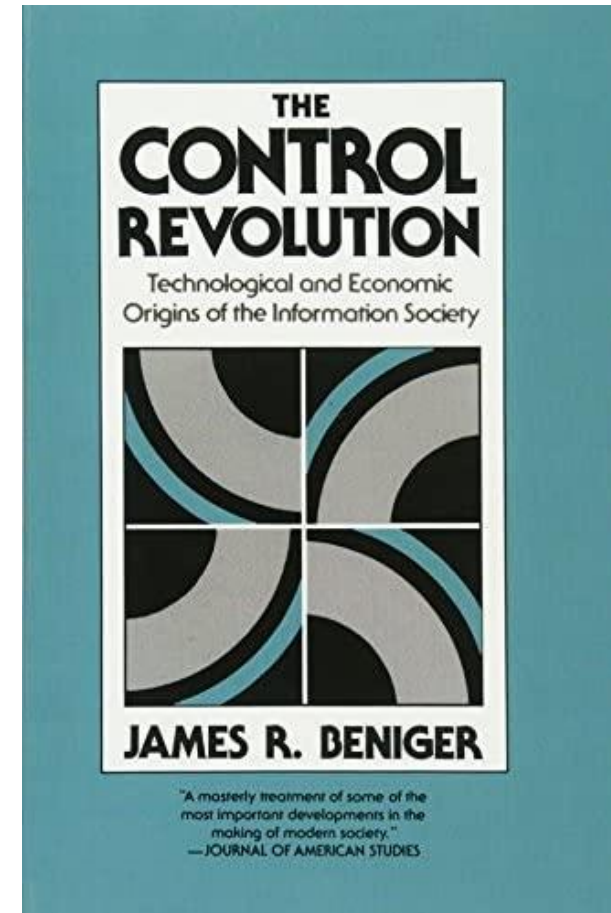
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- The industrial revolution created a “crisis of control.”
- **Control:** Purposeful influence toward a predetermined goal.
- The increased speed and scale of society brought logistic and trust problems.
- A society’s ability to maintain control will be directly proportional to the development of information technologies.



# Scientific Advancement

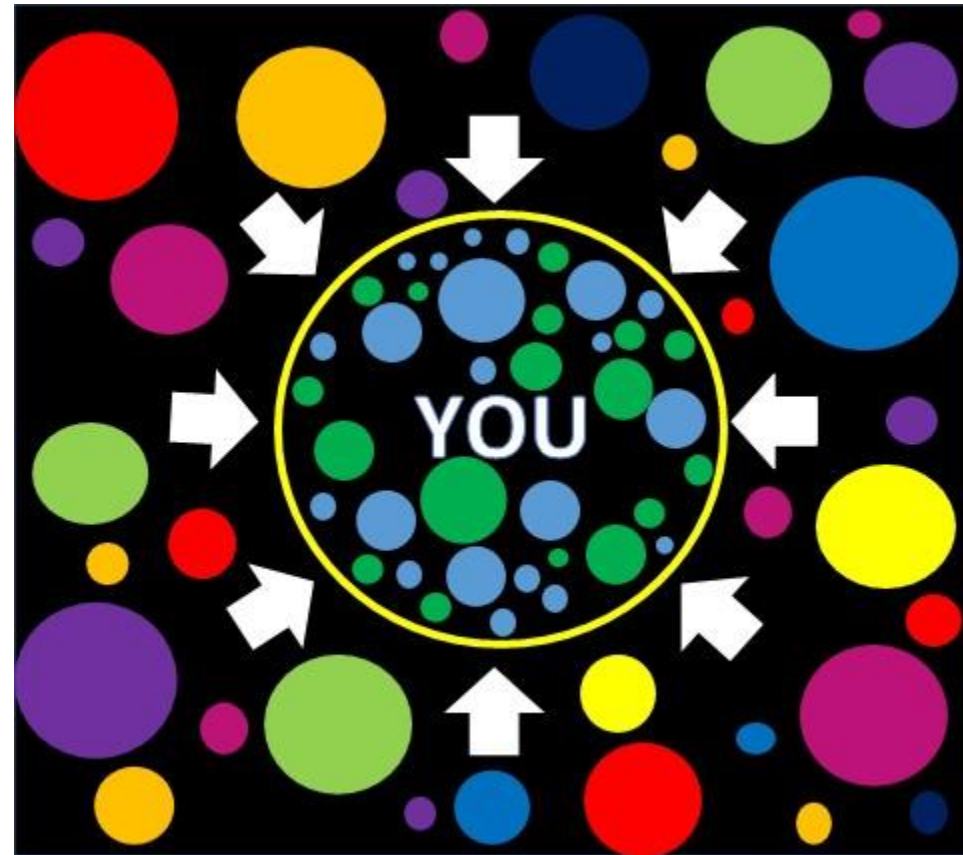
- For most of human history our ability to collect and model data on human behavior was relatively limited

What is causing polarization?

# A common answer:



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- Further, data from around the world suggests that while social media use is a global phenomenon, polarization is not (Boxell, Gentzkow, & Shapiro 2021). Why?

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- Further, data from around the world suggests that while social media use is a global phenomenon, polarization is not (Boxell, Gentzkow, & Shapiro 2021). Why?
- This doesn't necessarily mean that social media has no impact on polarization, but it does imply that the popular model is wrong.

# “Common Sense”

- Science has shown repeatedly that the reality of our physical and social worlds is often not what we expect. “Common sense” models often simply don’t reflect reality

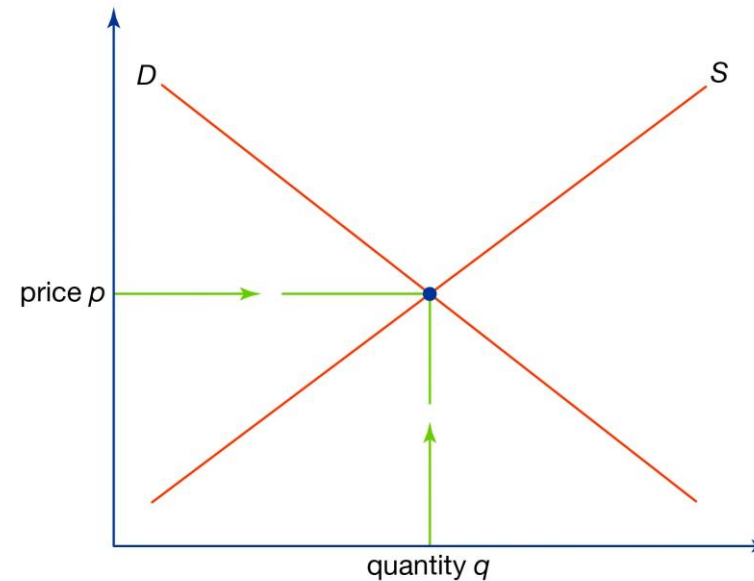
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  - Minimum wage and employment

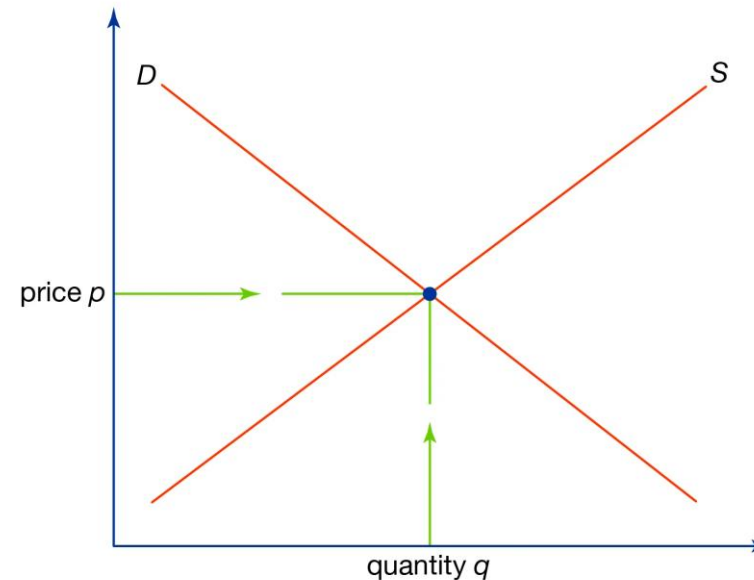
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  - Shy Trump voters

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- New technologies both create and solve crises of control.
- Your job is to harness data and information to create greater control.
- New data sources and processing power allows us to use this data in new domains. Especially the social domain.
- This allows us to test theoretical models of human behavior, which often leads to unexpected results!

# Modeling

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- **Data Generating Process (DGP):** Real world events that generate data.
- All data has a data generating process.
- Many of these processes can be represented mathematically.
- These mathematical representations are models. They are not the only kind of model, but they are the kind we will primarily be working with in this class.
- Different kinds of data have different DGPs, and thus merit different models.

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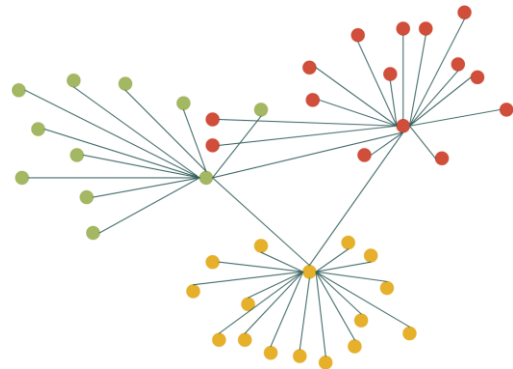
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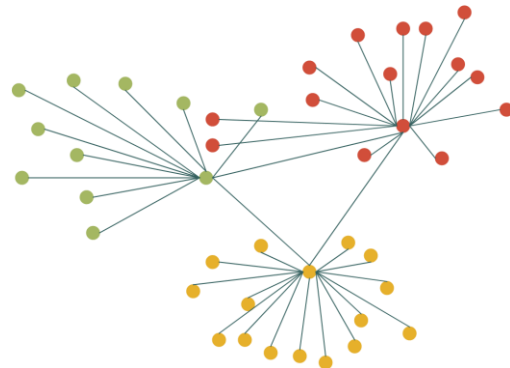
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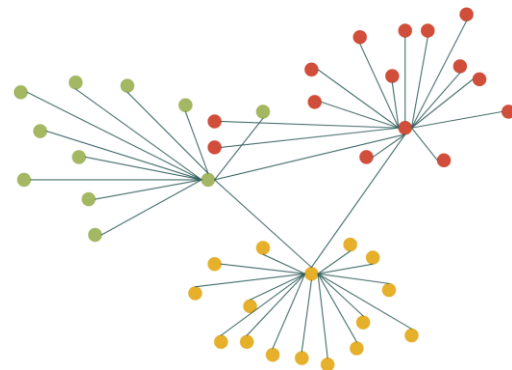
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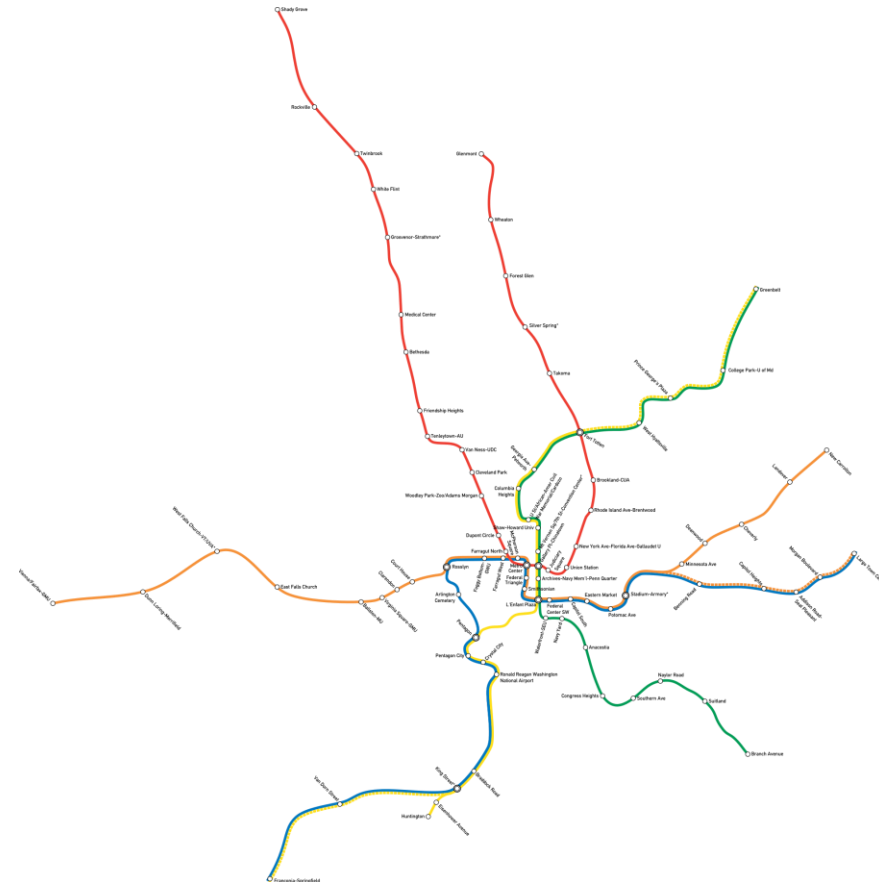
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1/9/78	1	DM	F	36
1/9/78	1	DS	F	135
1/20/78	1	DM	F	39
1/20/78	2	DM	M	43
1/20/78	2	DS	F	144
3/13/78	2	DM	F	51
3/13/78	2	DM	F	44
3/13/78	2	DS	F	146

# Limitations

# A simple model:



# Two models of the same system:



# Models are useful, but limited

- Endogeneity
- Measurement error
- Spurious correlation
- Misspecification
- Omitted variables
- Simultaneity

# Marketing

Why were some of the bad models we discussed successful?

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- Simple and intuitive



# Why were some of the bad models we discussed successful?

- Simple and intuitive
- Appeal to what we want

# Attractive ideas are effective ideas

- Writing (and thinking)
- Visualization

# Vocabulary

- Data Generating Process
- Model