Decision Making in a pandemic

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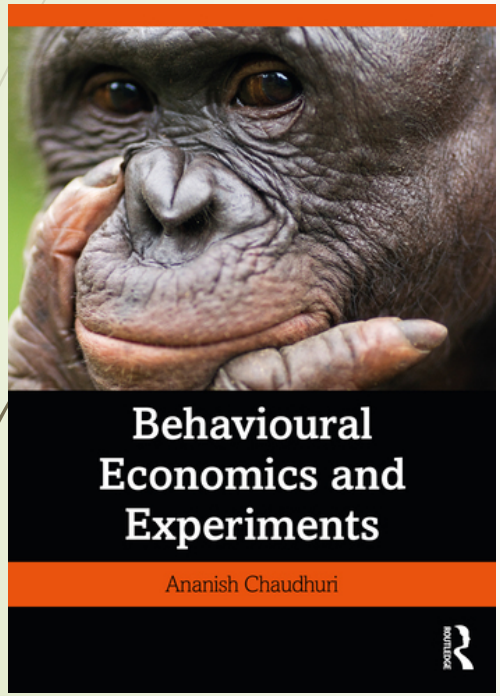
This talk is based on...



- A new book I am working on ***"Uncommon Sense (Or Why We lost Our Minds over Covid-19)***
- And current research

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Setting the scene

- ***A large part of decision making in a pandemic and/or global recessions is dealing with uncertainty.***

- Humans crave certainty and are not very good at dealing with events that are uncertain since we feel an acute loss of control.

- This leaves us vulnerable to making some systematic errors of judgement that often compound the problem.

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Key decision-making issues

- Opportunity cost of lockdowns
  - *Identified lives versus statistical lives*
- Framing and availability
  - *How many will die versus how many will live?*
- *"Underweighting"* of large probabilities and *"overweighting"* of small probabilities.

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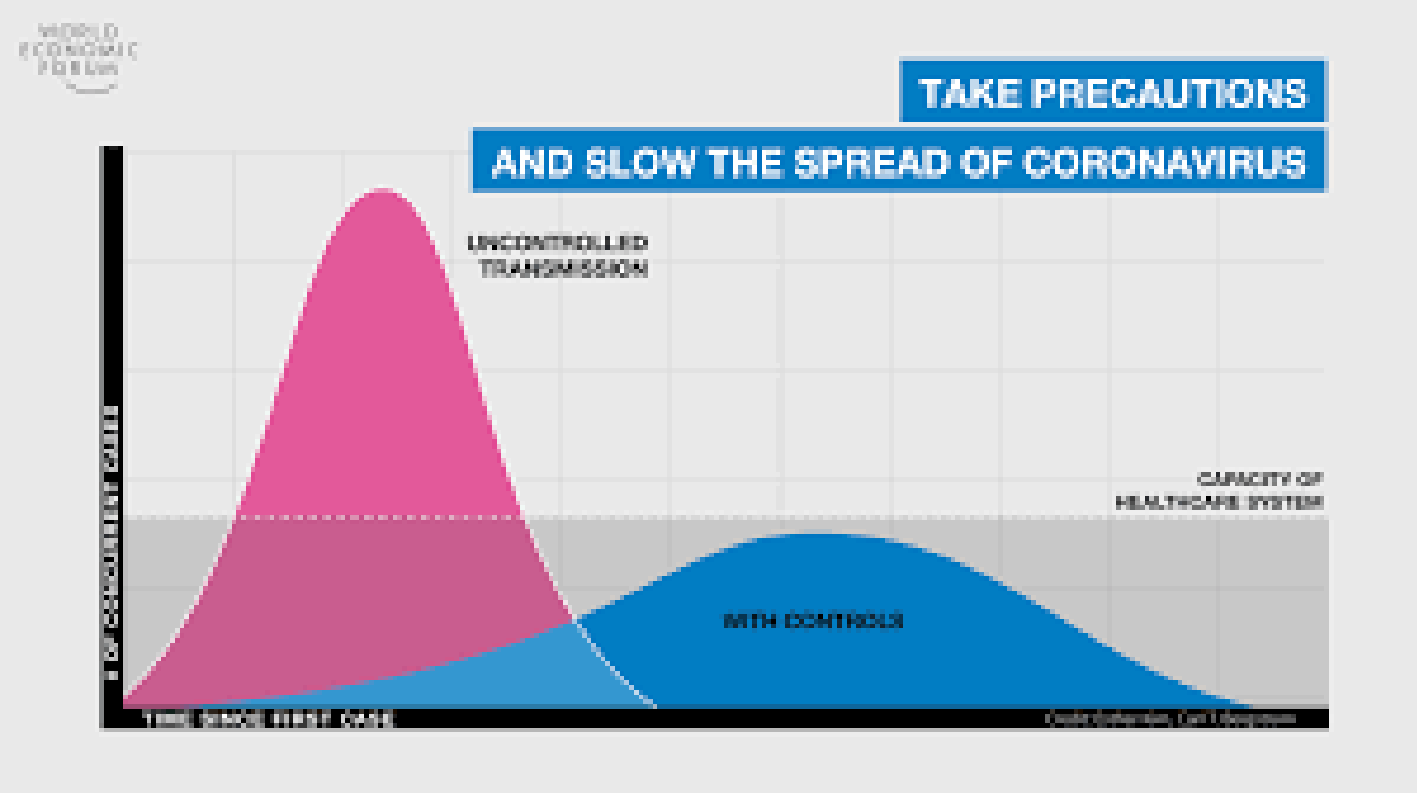
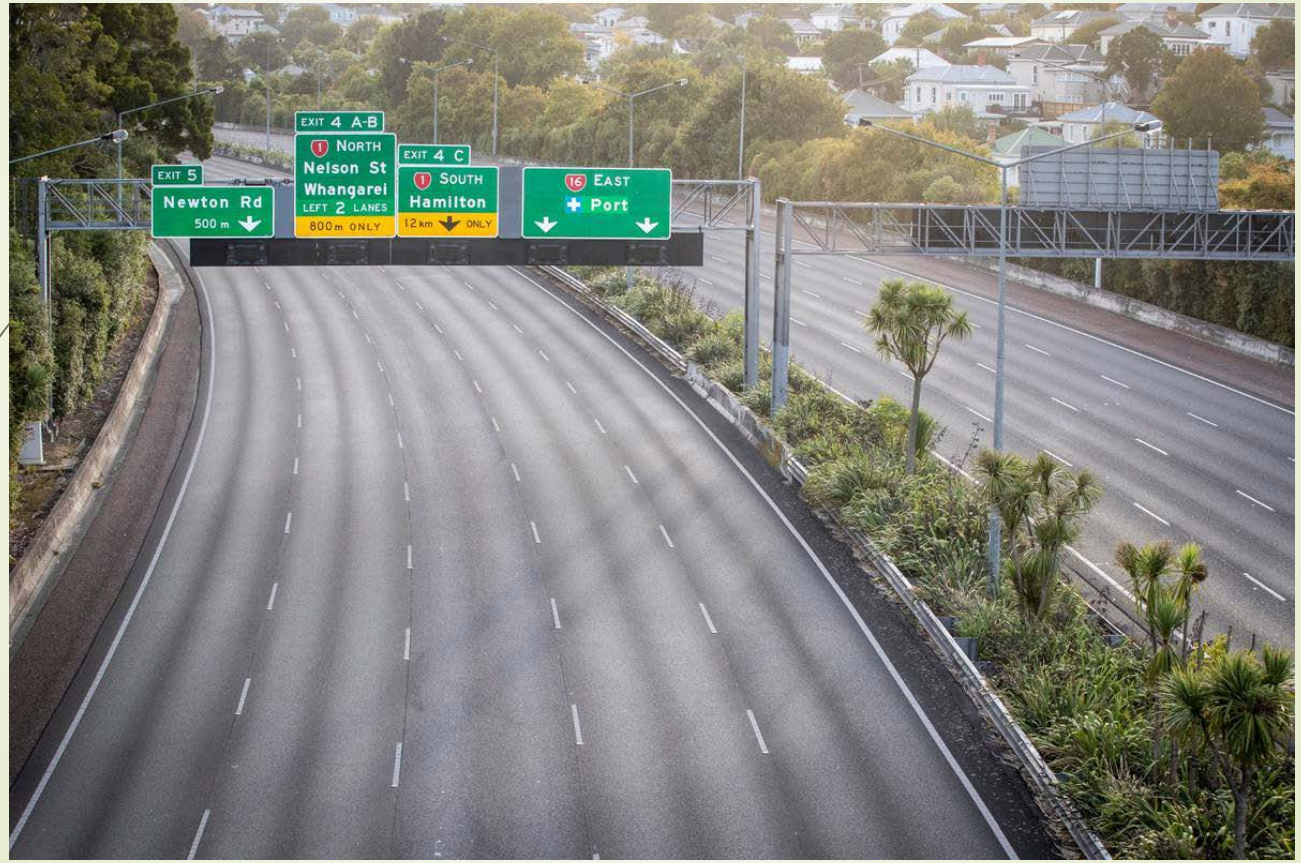
Covid-19: Flatten the curve?



Lockdowns


EXIT 5
Newton Rd
500 m
EXIT 4 A-B
1 NORTH
Nelson St
Whangarei
LEFT 2 LANES
800m ONLY
EXIT 4 C
1 SOUTH
Hamilton
12km ONLY
16 EAST
Port

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- Supposedly two binary options:
- ***Lockdown***
- ***Let it rip (unchecked community transmission)***
- *The former had massive support and questioning this led to tremendous backlash!*
- *But, in reality, there was a whole continuum from mitigation to suppression resulting in different trade-offs.*

- One key assumption behind mathematical models:
- People will not change their behavior at all even when faced with a deadly pathogen
- So, if the mortality rate is 1 in 100, then (say) in the US with 330 million people, 3.3 million people will die unless we lock down.
- This is not correct since even in the absence of any government intervention, people will take mitigating action on their own.

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Thomas Inglesby, Professor and Director of the Center for Health Security, Johns Hopkins University Bloomberg School of Public Health (2006)

- "There are no historical observations or scientific studies that support the confinement by quarantine of groups of possibly infected people for extended periods…
- WHO Writing Group: "forced isolation and quarantine are ineffective and impractical."
- Despite this…mandatory large-scale quarantine continues to be considered as an option…
- (This) reflects the views and conditions prevalent more than 50 years ago, when much less was known about the epidemiology of infectious diseases and when there was far less international and domestic travel in a less densely populated world

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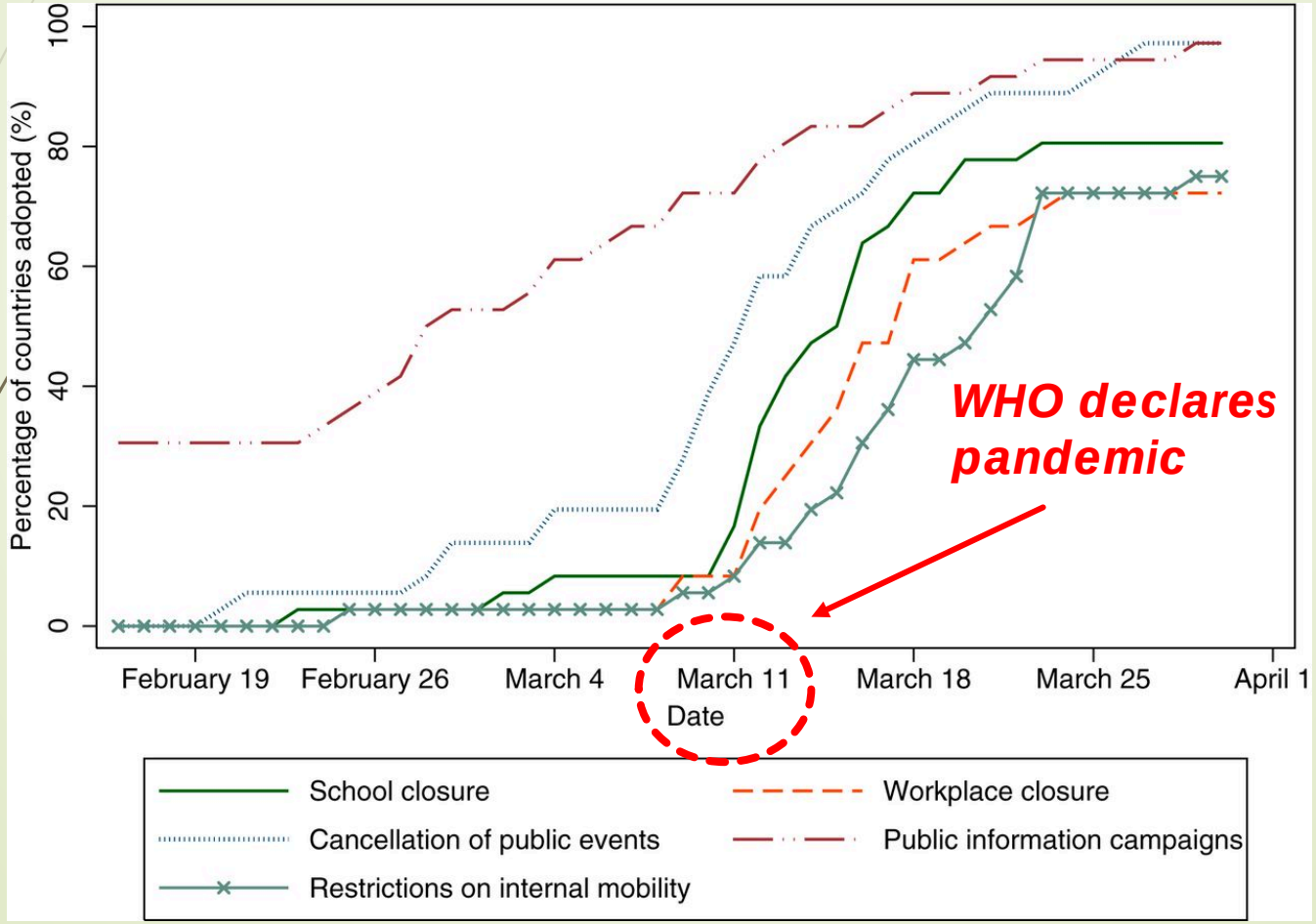
4 out of 5 OECD countries adopted essentially the same measures within a 2-week period in March!



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Flatten the curve?

- Even if you flatten the curve, the area under the curve remains unchanged.
- Lockdowns can suppress the spread of the disease temporarily but once you remove the restrictions the disease will start to spread again.
- Unless of course you are willing to keep things locked down for a very long time…
- ***Till a vaccine appears?!***

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Efficacy of lockdowns

- **Lockdowns do not reduce mortality**
- *Cross-section across countries*
  - *Chaudhuri, R., Dranitsaris, G., Mubashir, T., Bartoszko, J. and Riazia, S. (2020).*
- *Longitudinally within countries*
  - *Meunier, T. A. (2020)*
- Or cross-section *across different counties in the United States.*
  - *Gibson, J. (2020).*

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System 1 and System 2 thinking

- ***System 1:***
  - *automatic; fast; intuitive; reflexive*
  - *Jumps into action immediately*

- ***System 2:***
  - *deliberative, thoughtful, reflective;*
  - *engages later and requires cognitive effort*

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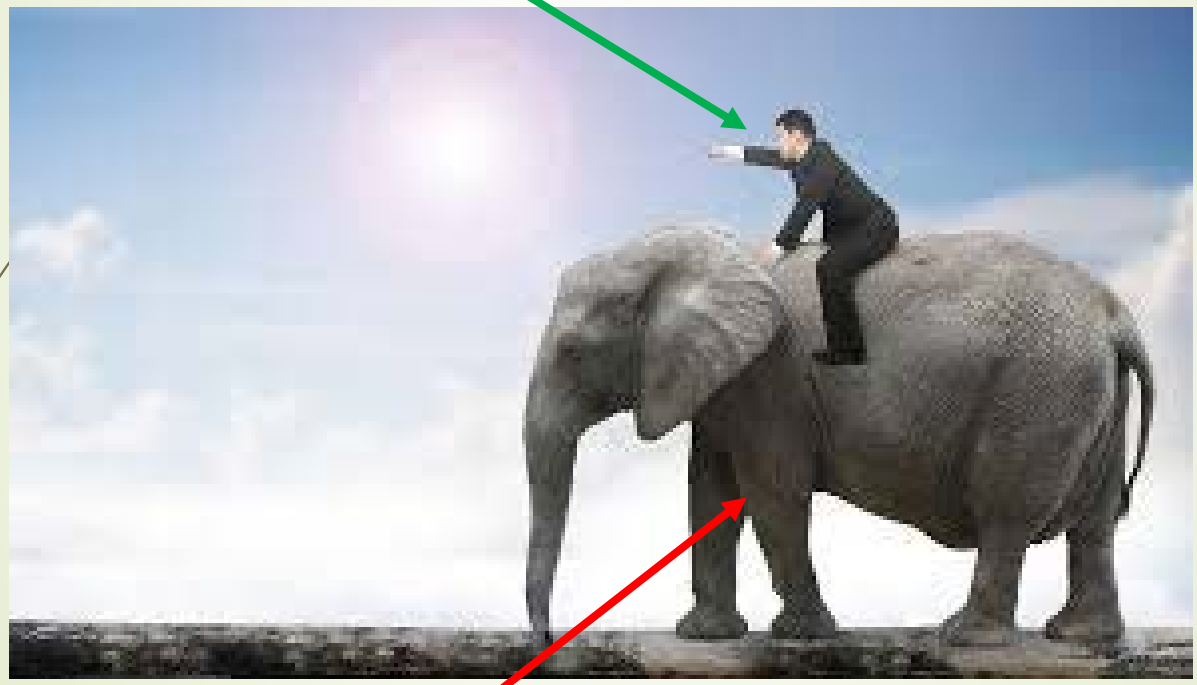
System 2: The rider; deliberative, thoughtful, reflective; May need to struggle to turn elephant around



System 1: the elephant; automatic; fast; intuitive; Lurches into action quickly and hard to turn around

- In the immediate aftermath of September 11, 2001, many Americans decided that flying was too risky.
- Instead, they chose to drive.

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- In the following 12 months, an ***additional 1,500 people*** lost their lives on the road.
- This is more than the total number of passengers who died on the four planes.
- We tend to focus excessively on ***"identified lives"; the loss of lives that are right in front of us.***
- We are afraid of losing a large number of lives in a short period.

- But, in doing so, we miss out on the loss of ***"statistical lives",*** which may be much larger.

- But these are scattered all over and not reported on in the same breathless manner by the media.

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The Telegraph of London, August 2020

- …more than 6,700 extra deaths in homes across the UK in the past two months – of which just 203 involved coronavirus. …
- deaths from other causes are soaring…
- millions of patients went untreated for killer diseases during lockdown.
- Among those under 65, the number of deaths caused by high blood pressure is up by one third…

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WHO and New York Times , May 22

- ... at least 80 million children under the age of one were at risk of diseases such as diphtheria, measles and polio as Covid-19 restrictions disrupted vaccination efforts resulting in a surge in polio and measles.

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	9% loss in GDP	15% loss in GDP	20% loss in GDP	25% loss in GDP
Lives saved				
440,000	*-68*	*-198*	*-308*	*-418*
250,000	*-140*	*-270*	*-380*	*-490*
100,000	*-170*	*-300*	*-410*	*-520*
50,000	*-185*	*-315*	*-425*	*-535*
20,000	*-194*	*-324*	*-435*	*-544*

David Miles, Imperial College and former member, Monetary Policy Committee, Bank of England

Framing and Availability

- ***Please rank order the following causes of death worldwide***

- *Terrorism, war and civil conflict*
- *Nutritional deficiencies including starvation*
- *Cancers of the trachea, bronchus and lungs*
- *Chronic obstructive lung diseases including emphysema*
- *Respiratory infection including pneumonia*

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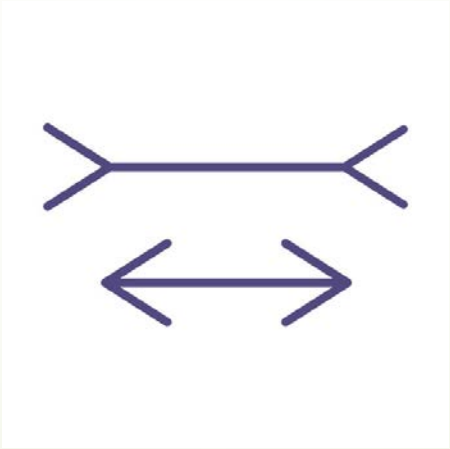
Availability Bias

- ***Most common response? Terrorism and war!***
- ***Respiratory infection is the biggest killer!***
- ***In the United States, more people die from drunk driving than terrorism!***
- The ubiquity of media coverage of wars/terrorism makes this more ***salient (available)*** in our minds.

The Mueller-Lyer Illusion
Which line is longer?

A

B



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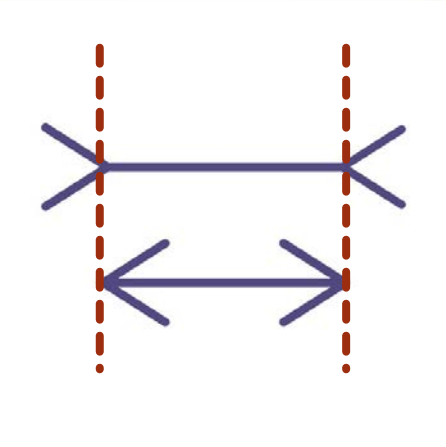
The Mueller-Lyer Illusion resolved



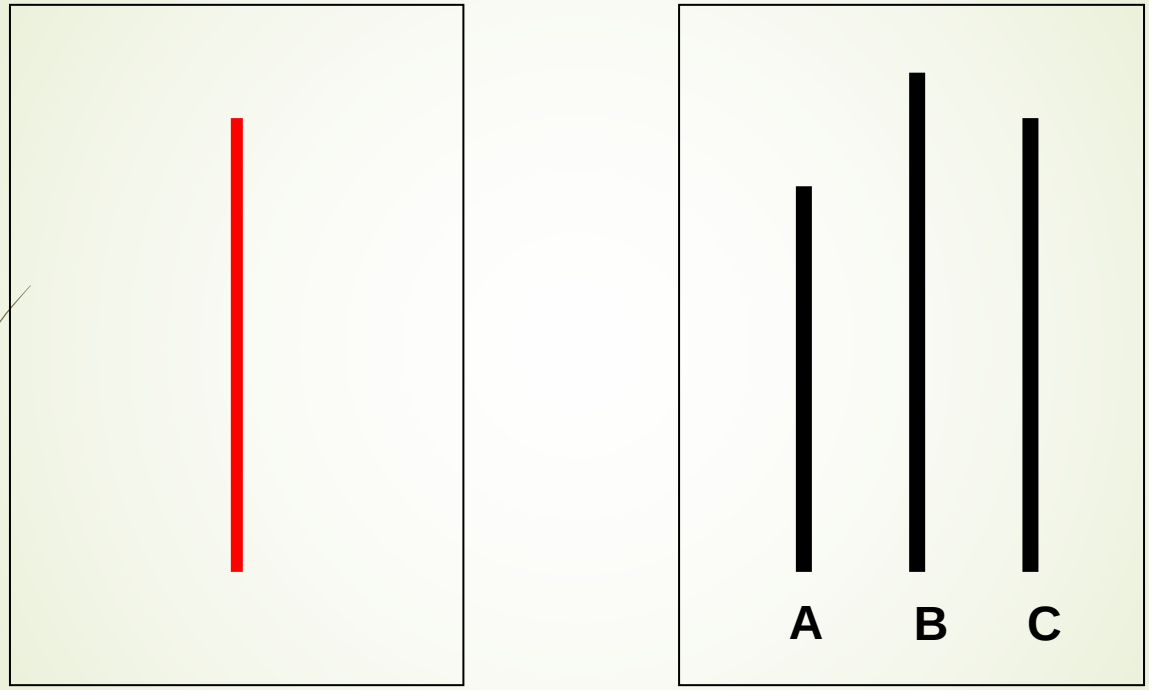


Figure 3-10: The cards with lines from Asch (1956)

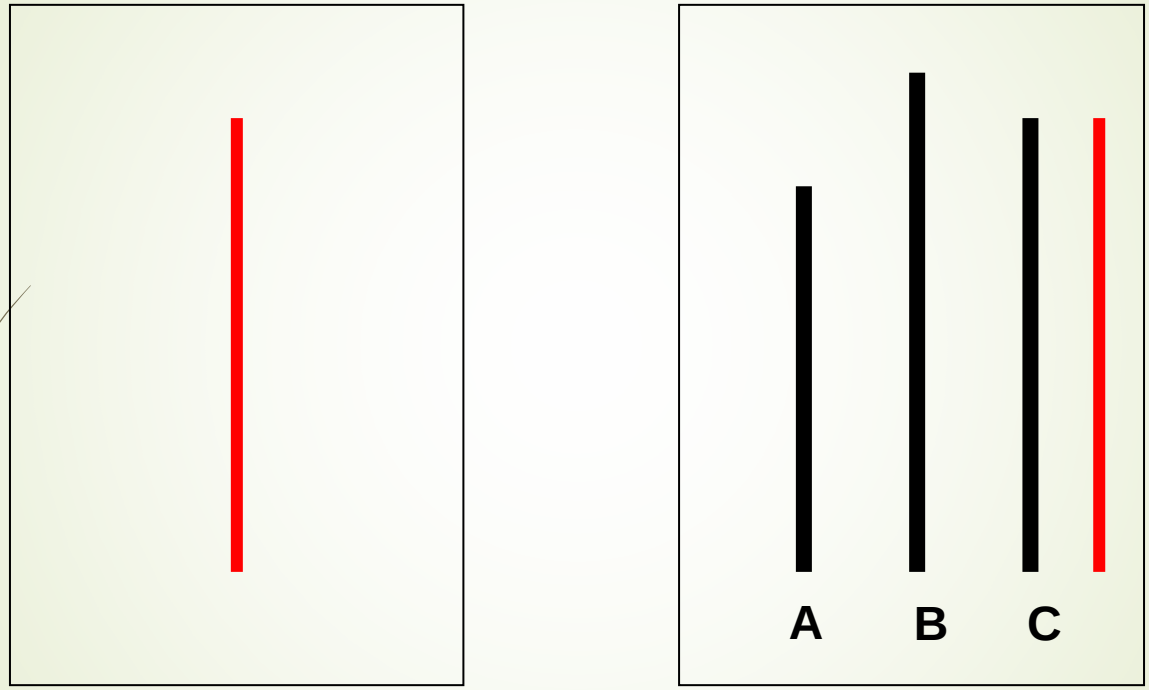


Figure 3-10: The cards with lines from Asch (1956)

Framing makes a difference

- Choose between two treatments for **600 people** affected by a deadly disease.
- Treatment A will save 200 lives but result in 400 deaths.
- Treatment B has a 1/3 chance that no one would die (200 lives saved) but a 2/3 chance that everyone would die (400 deaths).

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Framing makes a difference

Framing	Treatment A	Treatment B
Positive	Saves 200 lives	1/3 chance of saving all 600 people (200 lives saved); 2/3 possibility of saving of saving no one (400 deaths)

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Framing makes a difference

Framing	Treatment A	Treatment B
Negative	400 people will die	1/3 chance that no one will die (200 lives saved); 2/3 chance that everyone will die (400 deaths)

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Framing makes a difference

With POSITIVE Framing

Majority of participants chose Treatment A

With NEGATIVE framing

Majority chose Treatment B

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Gain	Loss
Choice A: 80% chance of winning $4,000. *[Expected gain = $3,200]* ***{Chosen by 20%}***	Choice A: 80% chance of losing $4,000. *[Expected loss = $3,200]* ***{Chosen by 92%}***
Choice B: Win $3,000 for sure. *[Sure gain = $3,000]* ***{Chosen by 80%}***	Choice B: Lose $3,000 for sure. *[Sure loss = $3,000]* ***{Chosen by 8%}***

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Loss aversion

- People prefer smaller surer gains over larger probabilistic gains.
- People prefer larger probabilistic losses over smaller surer losses.
- *People prefer smaller surer loss of lives (identified lives) over larger probabilistic losses in lives (statistical lives)!*

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Framing again

- ***Initially the WHO declared that the case fatality ratio (CFR) was 3.4%!***
- So, out of every 100 people who got the diseases around 3 will die.
- This is a very larger number especially when scaled up to millions of people in countries like China, India or United States.

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Framing again

- But is the CFR a meaningful number?
- The CFR refers only to those cases that are idenfied
- What we ideally want to know is the **Infection Fatality Ratio (IFR)**
  - ***Number of deaths divided by the number of people who contract the disease***

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Framing makes a difference

- Suppose there are 100 cases we know of and out of those 3 people pass away.
- CFR = 3%
- But suppose there are another 200 people who have the disease but were not tested and did not pass away.
- Now there are 300 people who caught the disease but only 3 of them died.
- IFR = 1%!

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Framing makes a difference

- Subsequently, the US CDC suggested that the IFR is only 0.65%. (round up to 0.7%)
- This means out of every 1000 people who catch the disease only 7 will die and 993 will survive.
- In other words, 1 out of every 153 people will die and 152 will survive!
- ***Survival rate of around 99%!***

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Framing makes a difference

- As of November 2020, 240,000 people have died of Covid-19 in the USA
- In 2018, more than 650,000 people died due to respiratory illnesses;
- Nearly 600,000 died from cancer;
- Around 167,000 from accidents and unintentional injuries;
- 85,000 died from diabetes;
- 51,000 from kidney diseases;
- and 48,000 from suicides.

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Questions

- How much are we willing to sacrifice for a disease that has 99% survival rate?
- IFR heavily skewed towards the elderly.
- Mean age of death = 82 years.
- Median age in Western Europe and US around 45 years; in India it is around 26 years.

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Lockdown till we get a vaccine

- Misunderstanding probabilities
- Once a probability is reasonably low, trying to push it down further starts to become prohibitively expensive.
- A risk of 1 in 152 is similar to the risk in many other routine activities.
- According to John Ioannidis of Stanford, among those under 65, this risk is similar to driving between 13 and 100 miles in many parts of the USA

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Conjunctive and disjunctive events

- Conjunctive means connected (or not independent)
- Disjunctive means not connected (or independent)
- ***What is the connection with vaccines for Covid-19?***

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Conjunctive and disjunctive events

- It is evening now. You live in Kolkata and you need to fly to Delhi the next morning on urgent business.
- You learn that there is a 30% chance of getting a flight on Indigo, 25% on GoAir and 20% of SpiceJet.
- What are the chances that you will be able to get on a flight?

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Disjunctive events

- Are the events disjunctive? Independent?
- Does this depend on idiosyncrasies of the airlines' flight schedules?
- Then the chances of your getting a flight is actually pretty high.
- How?
- Start by asking: ***What is the chance that I will not be able to get on a flight?***

Disjunctive events

- The probabilities (of not getting a flight) are 70% (0.7), 75% (0.75) and 80% (0.8) respectively.
- The chances that you will ***not be able*** to get on a flight is ***0.7*0.75*0.8 = 0.42.***
- So, the chance that you ***will be able*** to get on a flight is ***1 – 0.42 = 0.58.***
- More than 50-50 chance of being able to catch a flight.

Conjunctive events

- But now suppose early morning fog is causing havoc around Delhi airport and lots of flights are being cancelled.
- Now the events are no longer independent; rather they are dependent or correlated. (connected/conjunctive).
- This implies that if you do not get a seat on one airline, it is likely that you will not a get a seat on other airlines too.

Conjunctive events

- Now, of course your probability of getting on a flight has gone down dramatically.
- Your best option is to try on Indigo, where there is a 30% chance of getting on a flight.
- This is because, if you cannot get on Indigo then you are most likely not going to be able to get on the others.
- The probability getting on the other flights in now smaller than that of getting on Indigo.

The Linda Problem

- Linda is thirty-one years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and also participated in antinuclear demonstrations.
- Which of the following best describes Linda?
- (a) Linda is a school-teacher.
- (b) Linda is a bank teller.
- (c) Linda is a school-teacher and she is active in the feminist movement.

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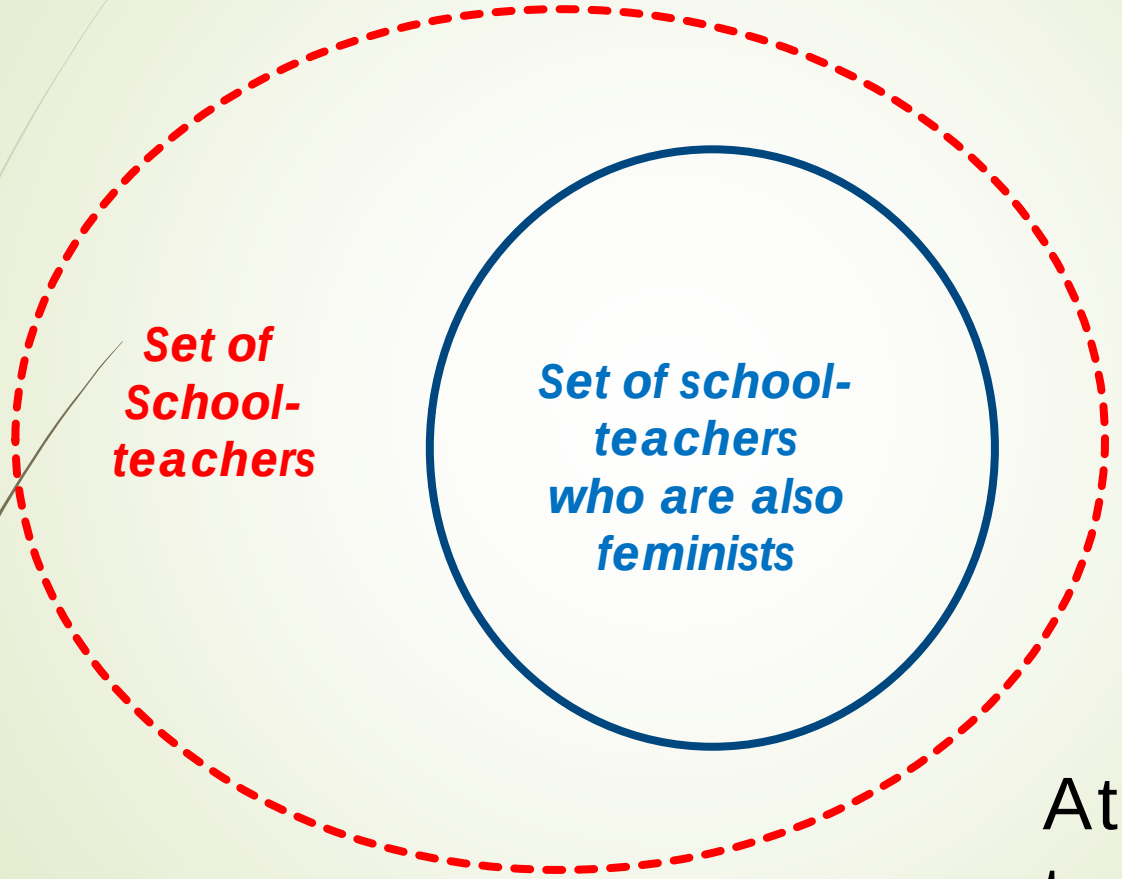

At best the two sets can be equal!

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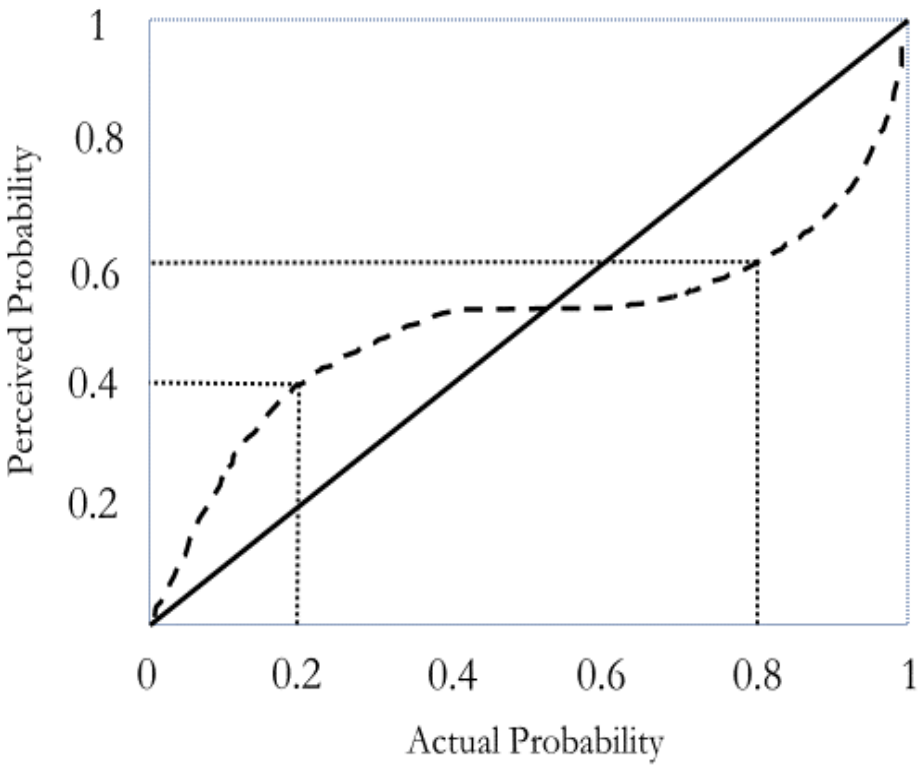
To develop effective vaccines

- Takes 8 -10 years
- Fastest vaccine (for mumps): 4 years
- The Varicella vaccine for chicken pox and FluMist (for Types A and B influenza): 28 years
- Rotavirus/Human Papilloma Virus (HPV): 15 years.
- Diphtheria, Polio, Tetanus and Pertussis (DPT): 11 years.
- ***In the case of Covid-19, the aim was to find a vaccine within 18 months!***



Actual and Perceived Probabilities
Kahneman and Tversky (1979)

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Actual and Perceived Probabilities

- ***"Overweighting"*** of small probabilities
- ***"Underweighting"*** of large probabilities
- Inverted "S-shaped" perceived probability function
- Actual probabilities are 20% (1/5) and 80% (4/5)
- But 20% is overweighted; seen as 40% (2/5) while 80% is underweighted; seen as 60% (3/5)
- Actually, one event is 4 times as likely as the other; but we perceive their probabilities as being much closer.

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Conjunctive events

- Effective vaccine
- And enough production
- And keeping them frozen (as needed)
- And distributing them around the world
- And…
- Likely? Yes.
- Going to happen soon? No!

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Gavi: The Vaccine Alliance

- Self-financing countries and funded countries
- Self-financing countries will get 20% before funded countries get any.
- Possibility of vaccine-haves and vaccine-have-nots
- Also given continuing patent protection; implications for pricing

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It's not a liberal-conservative thing!

(*Research funded by RSNZ Marsden Grant: UOA-17-074*)

- A popular view, at least in the West, during the crisis was that liberals were pro lockdown while conservatives were opposed.
- This unidimensional view of politics is incomplete, if not incorrect.
- Political attitudes formed as evolutionary responses to the challenge of human group living:
  - Who gets what, why and when?

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- Dual evolutionary foundations of political ideology
- There are ***economic conservatives and economic liberals.***
- There are ***social conservatives and social liberals.***

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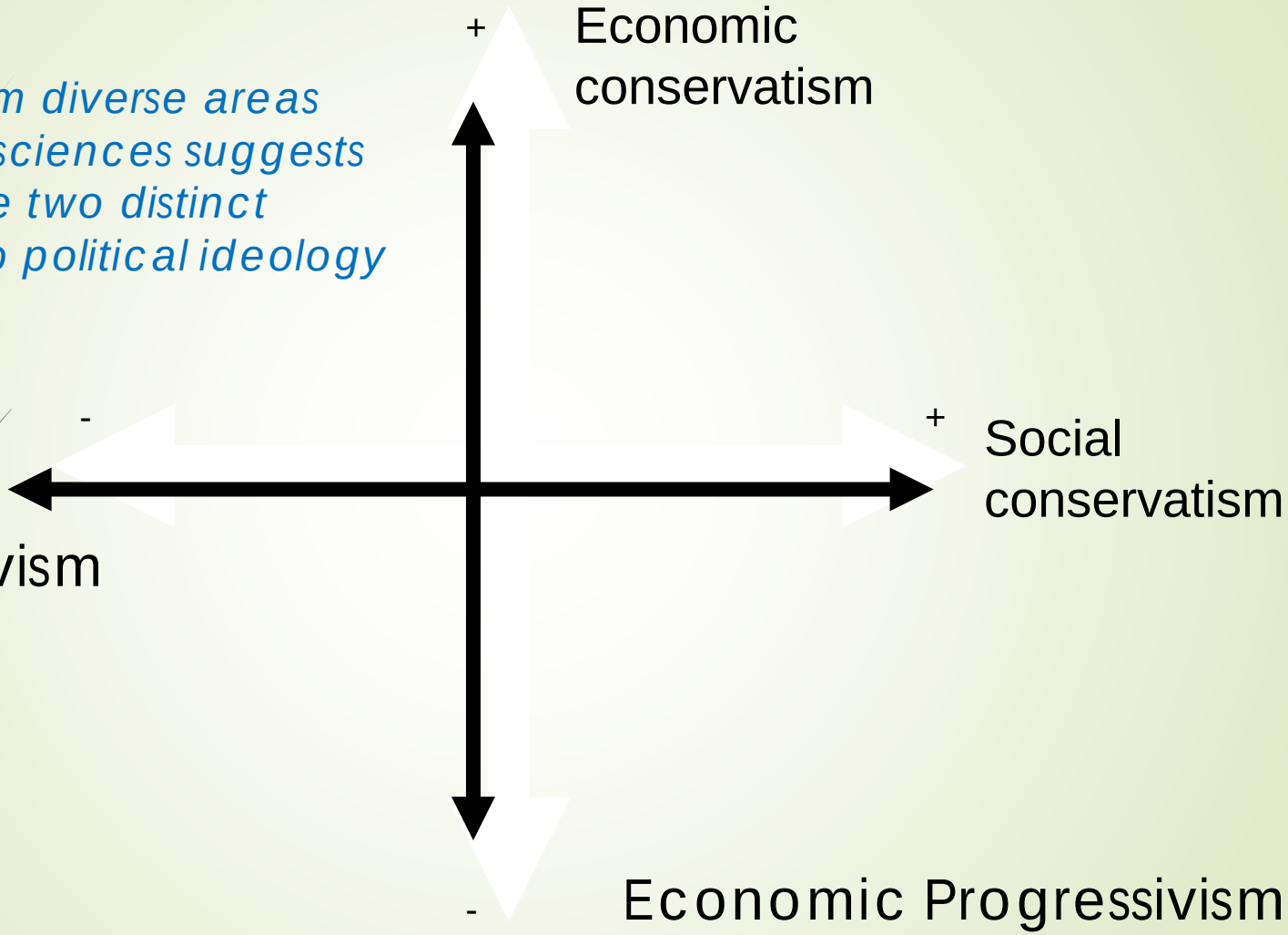
Evidence from diverse areas of the social sciences suggests that there are two distinct dimensions to political ideology



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Two dimensions of political ideology

- The first ***"cooperative/competitive"*** dimension is concerned with cooperating more across wider interdependent networks (beyond close kin) and sharing the spoils of cooperation more evenly.

- In our ancestral past, individuals had to constantly navigate cooperative dilemmas, such as collaborative foraging and meat sharing, and determine how to share the spoils of cooperation.

- ***This preference for cooperation underlies economically progressive policies such as progressive income taxation, income redistribution, the welfare state and pro-environmentalism.***

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Two dimensions of political ideology

- The second dimension is concerned with ***group conformity/group survival.***

- For early humans living in highly interdependent social groups, it was vital to abide by group-wide social norms, sanction norm-violators, and defend the group against outsiders.

- ***Today, we expect that analogous concerns about group viability will manifest themselves in attitudes regarding traditional social values, criminal justice, patriotism, and national security.***

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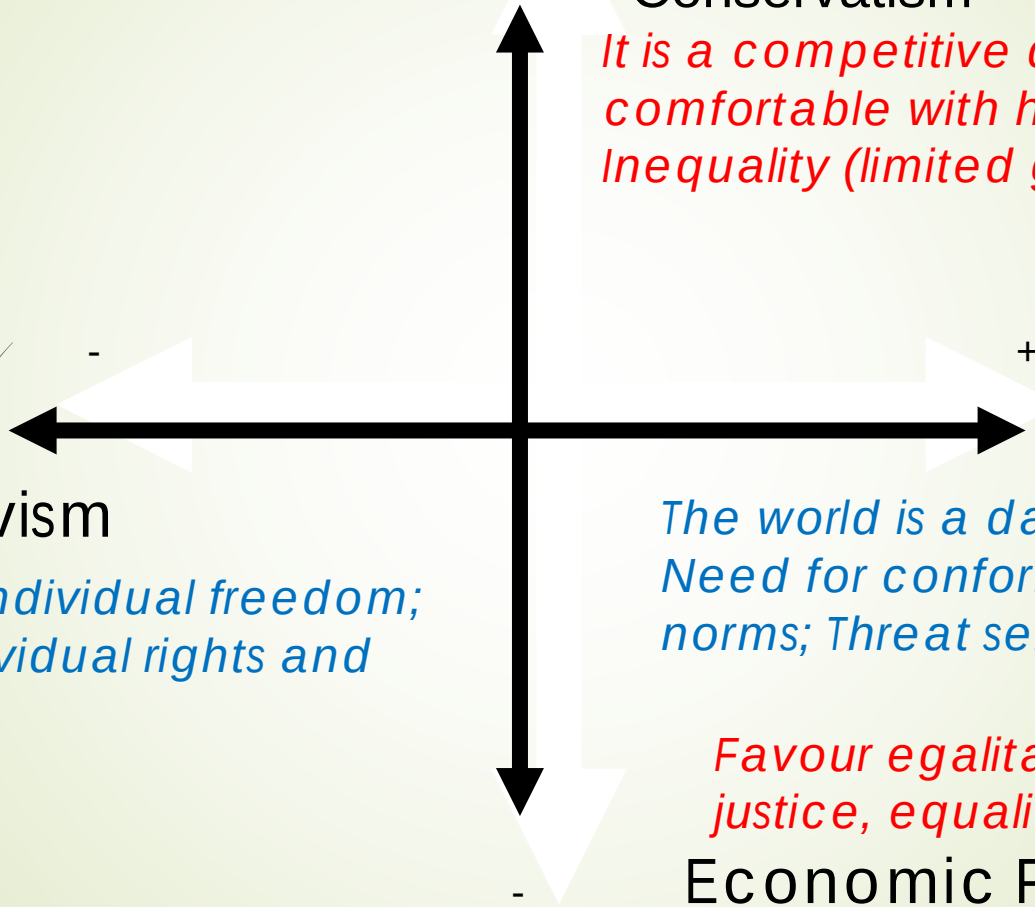

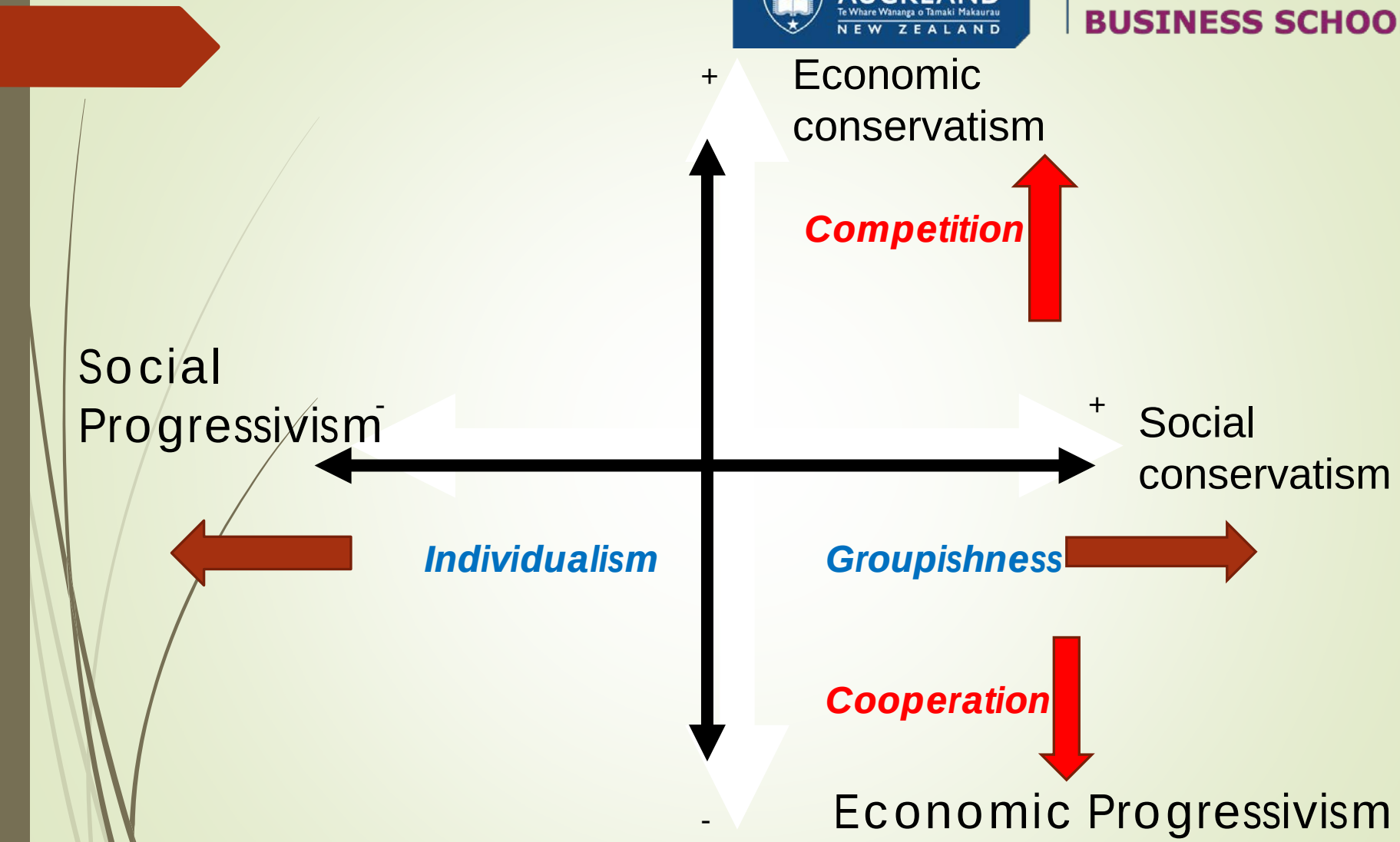
+
Economic conservatism
Competition
Social Progressivism
-
+
Social conservatism
Individualism
Groupishness
Cooperation
-
Economic Progressivism

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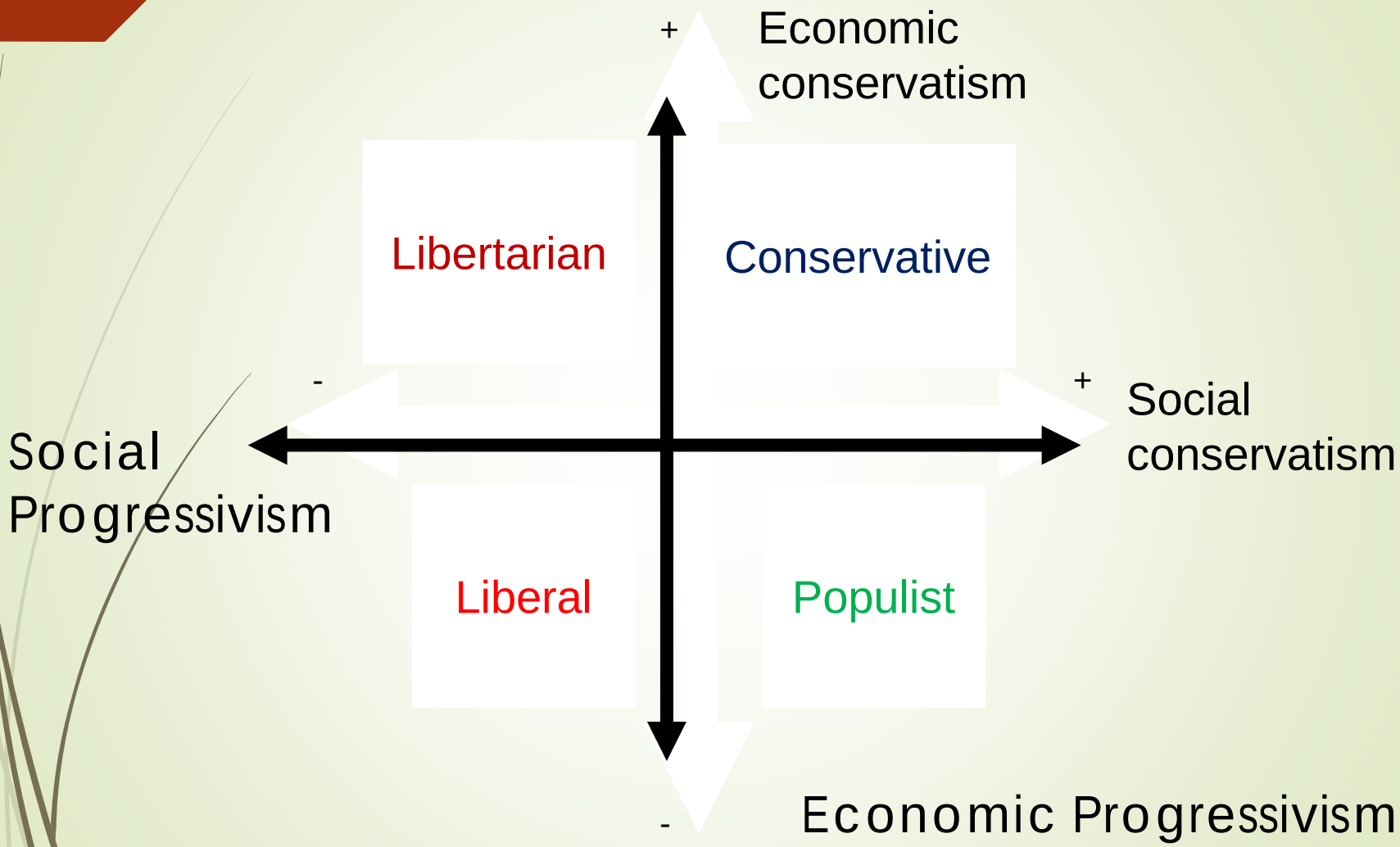

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It's not a liberal-conservative thing!

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- Economic progressives emphasize cooperation and egalitarianism and oppose hierarchies.
- Perceive physical distancing as the cooperative activity and hence support "stringent" lock downs.
- Social conservatives tend to be group-minded, group conformist and threat sensitive.
- They perceived lock downs as mitigating threat and were also supportive of strict lock downs.

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It's not a liberal-conservative thing!

(*Research funded by RSNZ Marsden Grant: UOA-17-074*)

- Resulted in a striking concordance in views between two disparate groups.

- But originating from very different views of the world; one based on the perceived cooperative activity and another based on perceived threat perception and pathogen aversion.

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Concluding remarks

- Essential to engage System 2 to avoid cognitive biases while making decision in stressful environments
- Be mindful of trade-offs and opportunity costs
- Pay attention to disconfirming evidence (Devil's advocate)
- Understand the role of probabilities in day-to-day life
- Our economics is not divorced from our politics

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That's my story and I am sticking to it.

Questions?