How to know if your public health policy will/did work

Nancy Cartwright

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PART 1

A Public Health Problem

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Barbados
SSB Tax 2015

The public health problem in Barbados

- Systematic reviews / meta-analyses: greater SSB consumption is associated with increased risk of high bodyweight, type 2 diabetes, hypertension, coronary heart disease
- Barbados:
  - NCDs estimated to account for > 75% of the total disease burden, with cardiovascular (20.4%), cancer (12.7%), type 2 diabetes (6.2%) and chronic respiratory diseases (2.4%) accounting for a substantial proportion
  - Adult rates of overweight and obesity estimated to be 74.2% and 43.4% (respectively) for women, and 66.2% and 23.4% for men
  - Rates of diabetes estimated to be 18.7%, compared to an estimated global rate of 9.3%
  - Average SSB consumption = 2.0 to 2.4 servings/day compared to a global estimate of 0.6 servings/day

Response

In June 2015, the Minister of Finance introduced a 10% tax on SSBs, framed as a response to the rising NCD burden, with a focus on the established links between diabetes and SSB consumption:

> *It is now an indisputable reality that Barbados is on the verge of a national crisis with regards to persistent health problems ... One of the major afflictions in this category … that has escalated in the past few decades is that of diabetes mellitus, which is now a major cause of sickness, amputation and morbidity on the island. … In Barbados, as is also the case in many other jurisdictions where diabetes is a major challenge, one of the products which is known to be heavily used by unsuspecting populations is sweetened beverages.*

The Question Here for Us

- How could you *predict* whether the tax would have the desired effect on sales / consumption / health?
- How could you *evaluate* whether it did?
- These involve singular causal claims

Help with this question

- We offer a ‘thick’ theory of singular causation
- That underwrites a variety of (generally familiar) ways to evidence it

PART 2

The Theory

About the theory

- 7 interlocking components
- Mostly familiar
- Generally uncontroversial
- But seldom assembled together to make a proper theory

About the theory

- An informative theory
  - Like a good scientific theory, it tells a lot about the concept in view
- Not a deep theory but it does an essential job:

It spawns a **well-grounded** category scheme for evidencing singular causal claims

  - Answering: ‘What kinds of information count as evidence for causation in the single case?’

About the theory (cont.)

Not nec and suff conditions

- Impossible to do well
- Without an informative theory alongside, nec and suff conditions are of little use

All the work of justifying evidence as evidence gets done by other assumptions

- Eg, causal Bayes nets axioms
- But too often not stated let alone defended

Consider the counterfactual account!!

The components of the theory

1. Formal features (asymmetry, transitivity – of the ‘right’ sort)
2. Initial cause and final effect connected by a **process**
3. Cause are **INUS** conditions (representable in POEs)
4. Cause produce effects through **activities**
5. Governed by **tendency laws**
6. The causal possibilities in a setting can be represented in a **singular causal equation model**
7. The **underlying social/political/cultural/economic/geographical structure** is what affords some processes and makes other unlikely

From theory to warrant

- The theory underwrites a categorization of types of local evidence relevant to singular causal claims
- It shows the role these play
- And justifies that they are evidence
- Understanding the role the separate pieces of evidence play is important for making an overall judgment about the strength of a case for the singular causal claim

Local evidence vs evidence from afar

Typically evidence from afar comprises

- Claims that the causal claim holds somewhere / widely / in a given type of setting / everywhere
- Theory that implies the causal claim
- …

We are concerned with LOCAL evidence about THIS setting at THIS time

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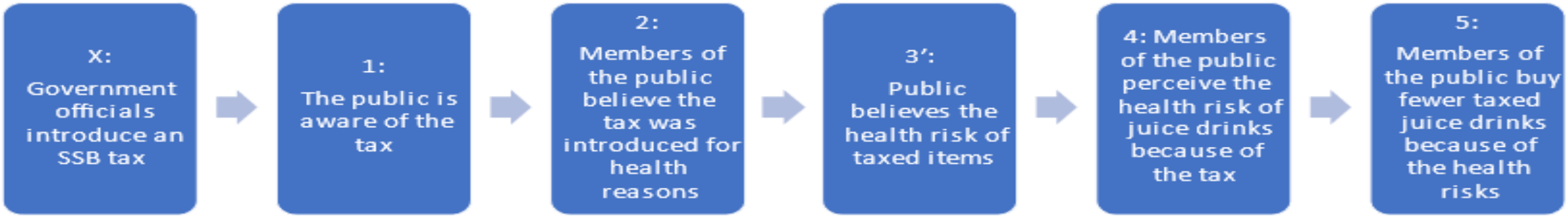
Start with component 2 -- processes

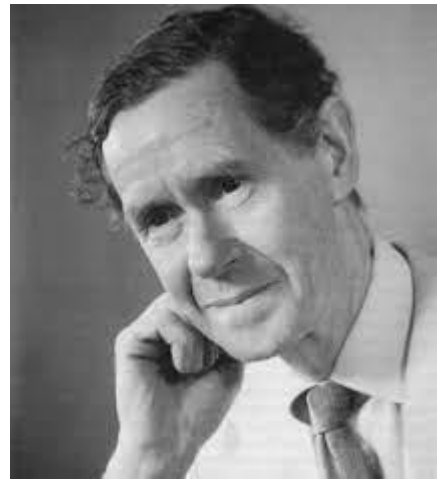
- This justifies producing a standard ‘box and arrows’ theory of change
- That plays a central role in evidencing the overall singular causal claim
- For the Alvarado ex post evaluation of the Barbados SSB tax, there were 2

SSB process: Via a price effect

Via signaling effect



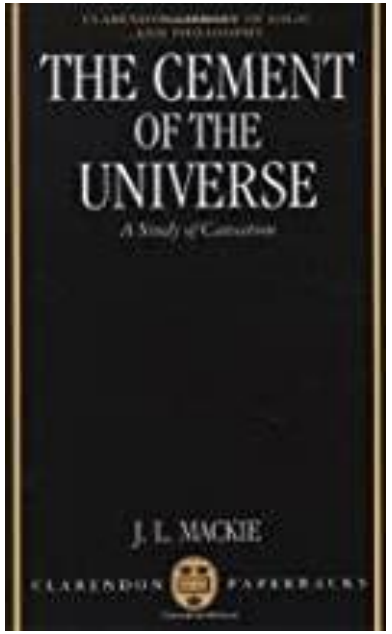
Theory component 3



Causes are INUS conditions (JL Mackie)

$$O(u) \; c\equiv B(u)\&C(u) \; v \; W$$

$$y(u) \; c= \beta(u)x(u) + w(u)$$



- NOT ‘INUS conditions are causes’
  - Think ‘spurious correlation’
- RHS are the possible causes of E/y for u in this setting at this time

B(u)/β(u) = ‘Moderators’/ ‘Interactive variables’

1. Support factors

2. Absence of derailers

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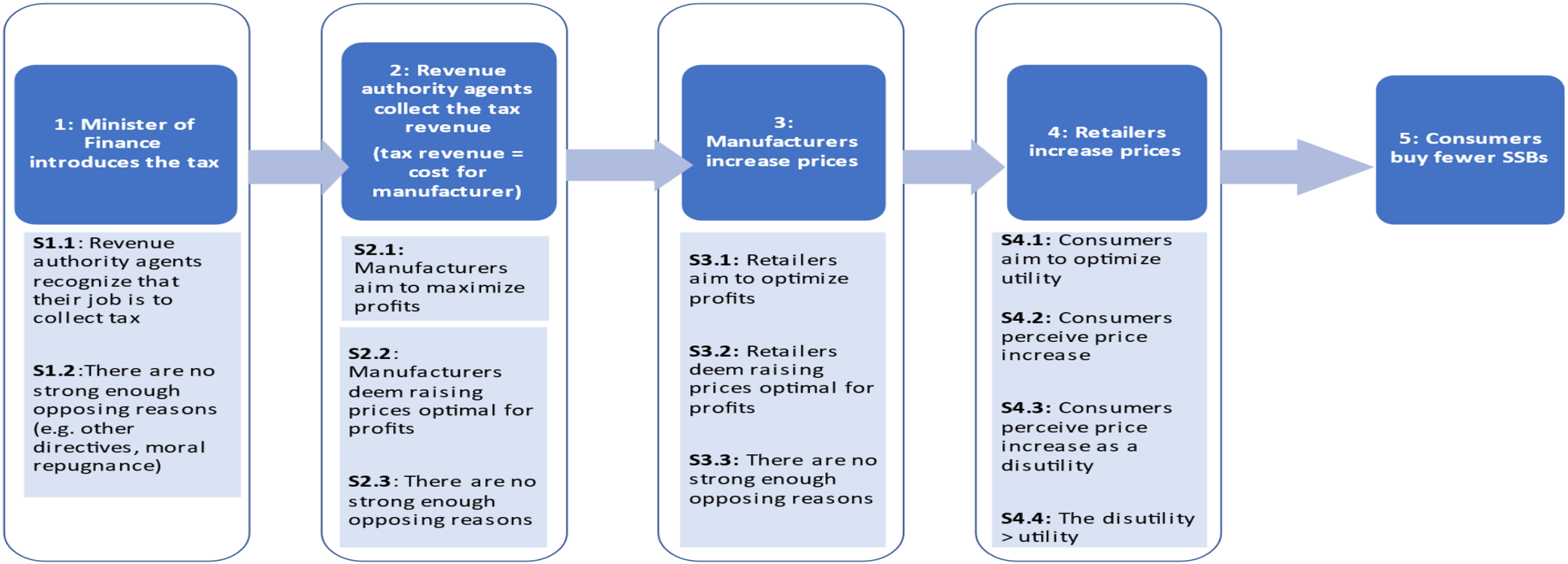
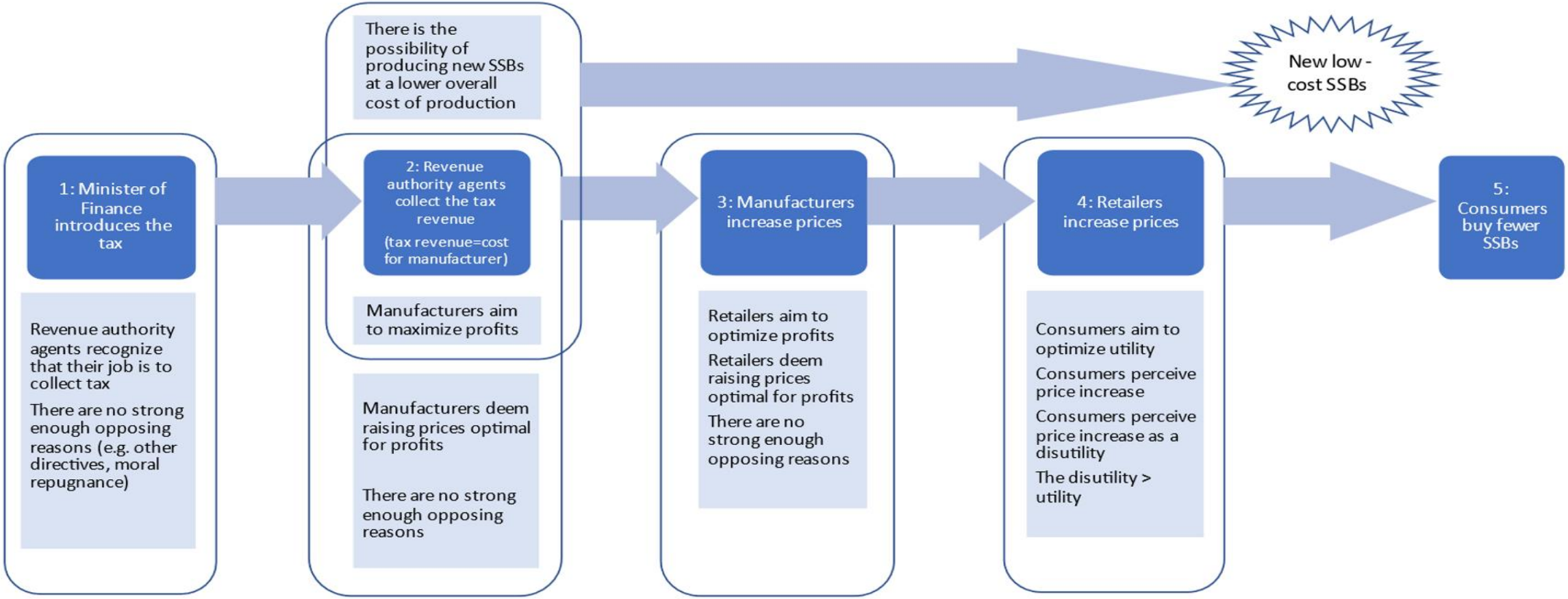
Epidemiologist pies– for each step in the process

SSB tax
Step 1

Support factors – via price mechanism



Derailer—via price mechanism



Components 4 & 5:

Activities and Tendency principles

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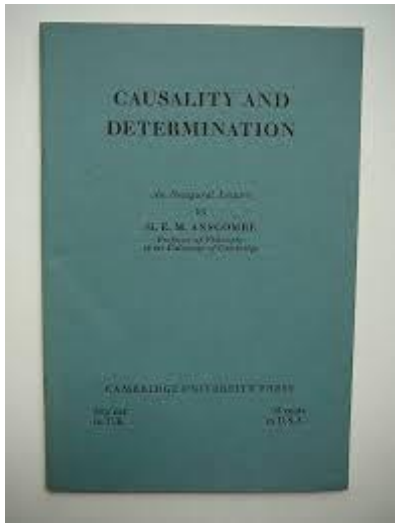
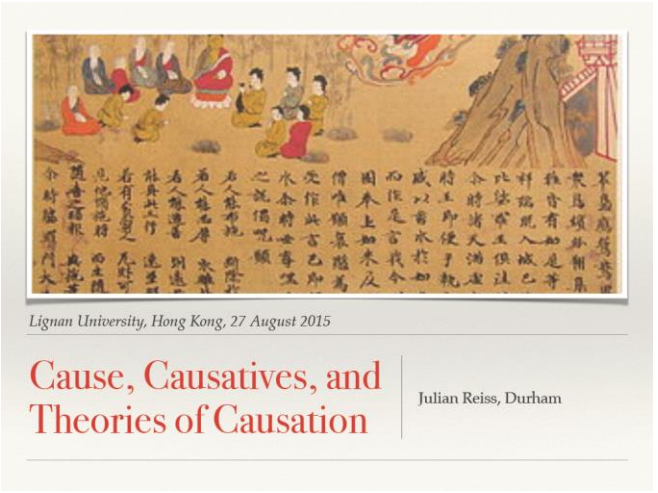
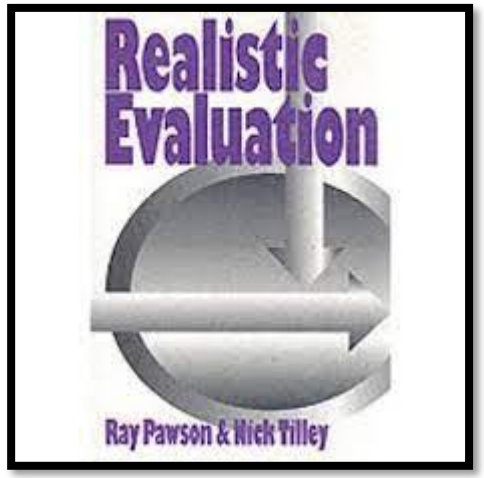






Components 4 & 5:
Activities and Tendency principles

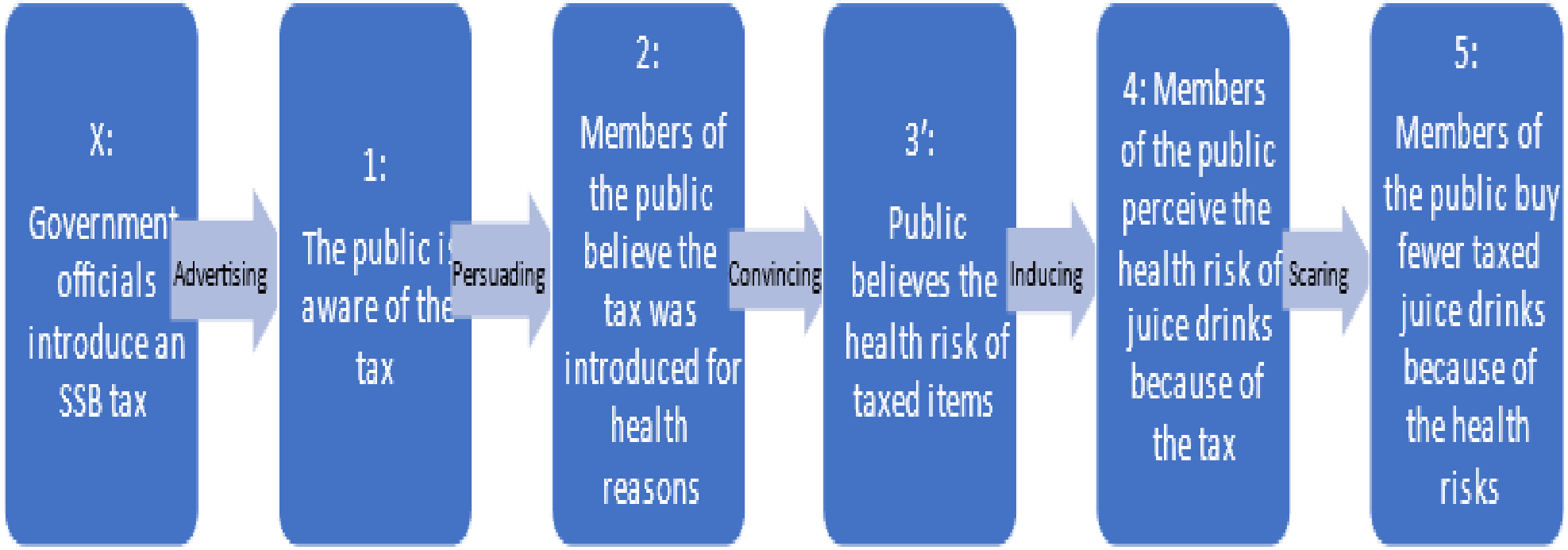
- Causes don’t just sit there miraculously followed by their effects
- They DO something to produce the effect:

Price effect: the tax makes SSBs more costly

Signaling effect: the tax warns people of the health hazards

Components 4 & 5:
Activities and Tendency principles

3’ → 4: the public’s belief in the health risk of taxed items – plus their recognition that it is SSBs that are taxed and their belief that the government would not deceive them about this – *induces* the public to believe that SSBs are risky.



Components 4 & 5:
Activities and Tendency principles

WHY BELIEVE that warning the public that SSBs are risky induces them to avoid them?

WHY BELIEVE that making SSBs more costly reduces sales of them?

Because of 2 familiar general principles:

- Warning people that something is dangerous induces them to avoid it
- Increasing the cost of something reduces the quantity of it purchased

Clearly not ‘laws’ like the law of gravity

Rather….. Tendency principles

When it comes to warrant we agree with Donald Davidson

- Justifying that a fact cited as evidence IS evidence for singular causation…

Relies on supposing the singular connection occurs in accord with a general causal principle

- Though not strict principles but
- Tendency principles

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Components 4 & 5:
Activities and Tendency principles

Ala JS Mill, Jan Elster and me

Tendencies and their principles

- Tendencies do not usually obtain everywhere
- The principles are usually expressed as GENERICS
- They often ‘contradict’ one another (we have many opposing tendences!)
- They don’t usually tell what will result
- But describe what the cause **tends to**
  - You may have to trigger the cause
    - The indicated effect is not the observed outcome because other causes also influence it
  - Still, the cause may push the outcome in the direction indicated

Why tendency principles matter

We suppose that the presence of support facts and absence of derailers (or presence of guards against them) ARE evidence for a singular causal connection ala Mackie

BUT…

What justifies supposing that THESE PARTICULAR factors are support factors/ derailers/ safeguards?

Answer:

An associated tendency principle

Warning people that something is dangerous induces them to avoid it →

Support factors

- They believe the warning signaled by the SSB tax
- They are able to avoid buying SSBs
- They understand that it is SSBs that are dangerous

OOOPS..the planners missed this

Many people did not recognize that JUICE drinks were also dangerous:
It was commonly called ‘the soda tax’

Explicitly considering the principle helps you identify the support factors

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Increasing the cost of something reduces the quantity of it purchased

Suppose all support factors are there

Still need the absence of derailers

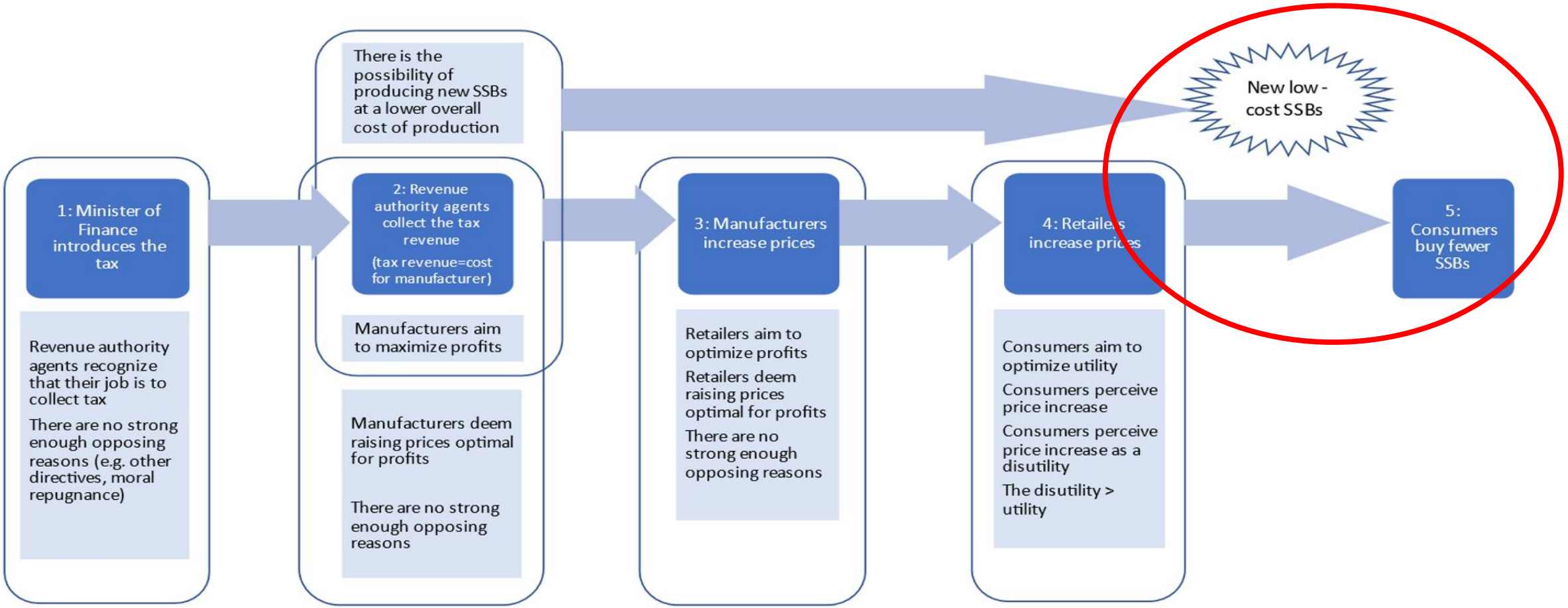
So: …… UNLESS derailed by (inter alia)

The operation of a competing tendency:

The substitution effect

Made possible by the invention of a cheaper way to produce and deliver to market other equally harmful, equally appealing SSBs

Derailer—via price mechanism



PART 2

Theory of singular causation
+
situation-specific ToC
→
Categories of roles local evidence can play

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Evidence can play the role of supporting …

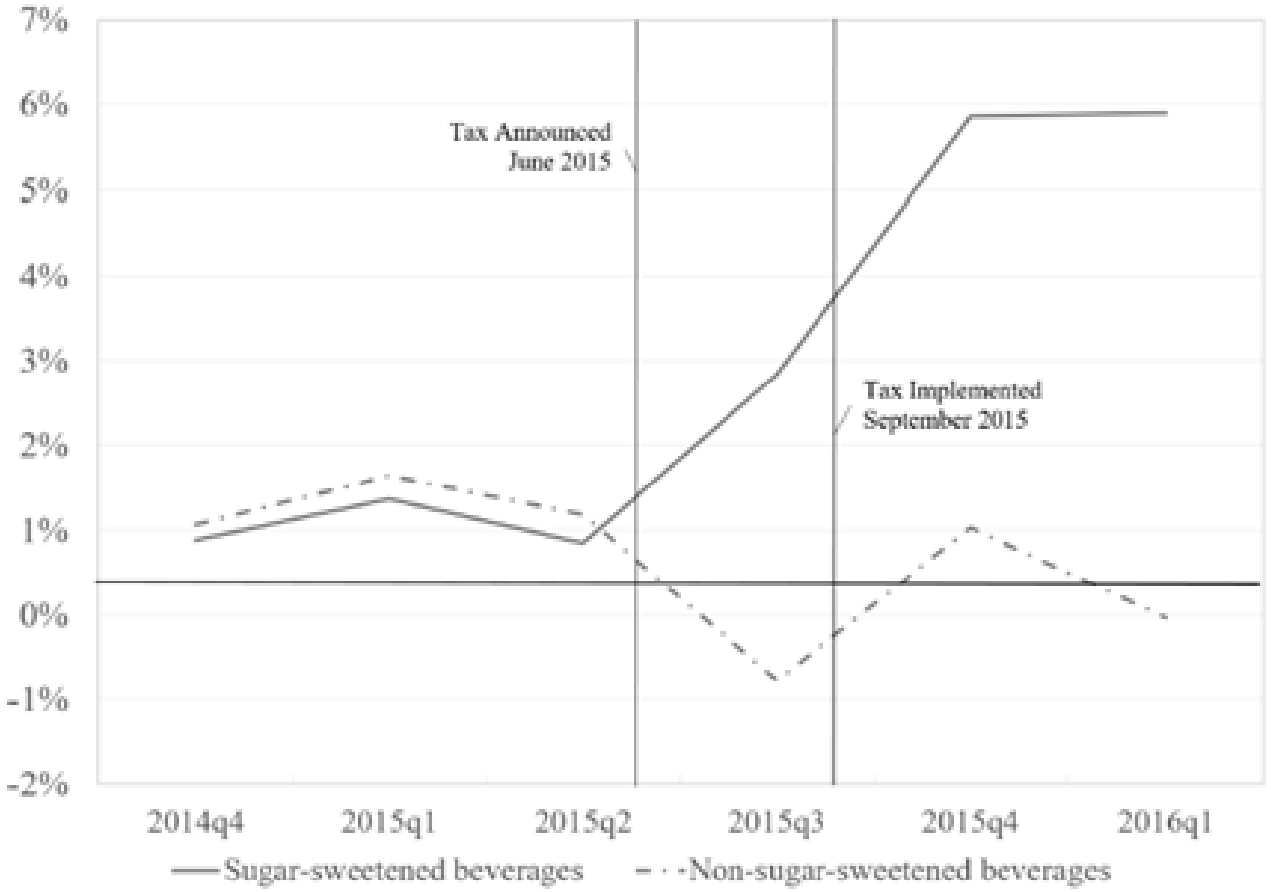
- Cause in box n occurs?
- Effect in box n+1 of the cause in box n occurs?
- Timing of the effect in box n+1 is right?
- Support factors for box n to contribute to box n+1 occur?
- Derailers from box n to box n+1 are absent or guarded against?
- Activity and causal principle from box n to box n+1 obtain?
- Underlying system is right to afford box n to cause box n+1?

Timing (Recall Bradford Hill)

- ‘In the two quarters after the tax took effect, the growth in average SSB prices compared to the previous year reached 5.9% while staying mostly flay, between 0 and 1% for non-SSBs.’
- But there was a wrinkle when it comes to timing

The two vertical lines correspond to June 2015, when the tax was first announced and to September 2015, when the tax was first implemented. It is possible that manufacturers or retailers may have increased prices following the announcement of the tax, in anticipation of the actual implementation date.

Figure: Year-over-year percent change in the average quarterly price per liter of sugar-sweetened and non-sugar-sweetened beverages, Barbados, 2014-2016[1]



[1] The first line corresponds to June 2015 when the tax was first announced, and the second line corresponds to September 2015, when the tax was first implemented

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Evidence can play the role of supporting …

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SSB tax…. Via a price effect

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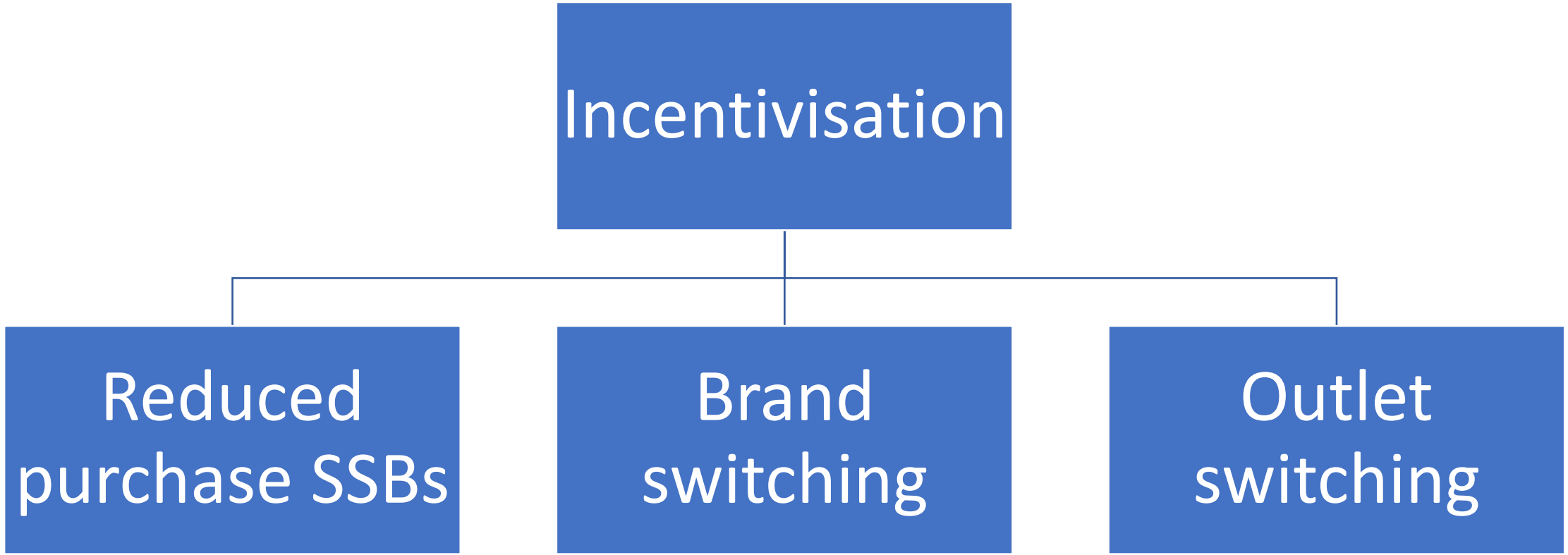
ACTIVITY = Incentivisation: the high price incentivises consumers to purchase less

PRINCIPLE = people act to maximise their expected utility

Evidence for this?

- Reports from consumers themselves
- Side effects that might have been produced as well had incentivization operated

Side effects of incentivisation to reduce puchase



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Evidencing side effects

Outlet-switching

- ‘[A] sensitivity analysis … highlighted the substantial variation in SSB prices across store types, creating the opportunity for consumers to substitute towards lower-priced stores in response to the introduction of a tax.’

Brand- & product-switching

- ‘After stratifying by price, we found evidence of substitution to cheaper SSBs.’
- ‘The Barbados SSB tax only addressed around 60% of soft drink-derived free sugars and did not clearly differentiate between high- and low-sugar SSBs. This highlights that the tax design may have incentivised substitution towards untaxed SSBs and in particular, towards higher-sugar untaxed SSBs.’

Alvarado 2020

PART 4: Conclusion

Why bother with all this?

1. Evidencing that each step in the ToC occurs matters

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2. Our catalogue of evidence roles shows the types of information that can support a step in the ToC

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3.Understanding the role each piece of evidence plays is a huge help in making an overall assessment

4. Solid grounding

- That these evidence types ARE evidence
- And why
- And just what roles they play

Are underwritten by systematic theory that almost anyone can accept

So: They are rigorously supported as evidence types (just like, they say, RCT results are)

Thank you & goodbye