Damages and Valuation MOOC – Module 2.6

Use of statistical and econometric analysis in the assessment of damages

Dr Meloria Meschi and Ravi Kanabar

Economic and Financial Consulting, FTI Consulting

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DELOS dispute resolution

The presenters

Dr Meloria Meschi

meloria.meschi@fticonsulting.com
+44 7545 301 465

A double PhD in Economic Policy and Economics (Applied Econometrics), Meloria has over 20 years' experience in applying economic and statistical analysis to complex litigation, regulatory, and policy issues in a wide variety of industries.

An experienced witness, she has been appointed as an expert in disputes before national courts and international arbitration tribunals in more than 20 occasions. Meloria is recognised in WWL Arbitration Experts 2023: "*She can explain complex statistical and quantum theories and approaches in a user-friendly and easy-to-understand way*", and "*Meloria presents exceptionally well before clients and tribunals*".

Education, qualifications, and affiliations

- B.A., Economics and Politics, Genova University
- M.A., Economics, Warwick University
- Ph.D., Economics (Applied Econometrics), Warwick University
- Ph.D., Economics and Social Policy, Genova University
- Fellow of the Royal Statistical Society

Ravi Kanabar

ravi.kanabar@fticonsulting.com
+44 20 3727 1280

Ravi Kanabar has over 10 years' experience in consulting as an applied economist and econometrician. He specialises in applying sophisticated economic, statistical and financial techniques to assist organisations facing complex commercial, legal and policy issues – particularly in contentious situations.

Mr. Kanabar regularly advises parties, courts and arbiters in commercial litigation and international arbitration, including by assisting in the preparation of independent expert reports for the High Court of England and Wales, various international courts, and arbitral tribunals.

Education, qualifications, and affiliations

- B.Sc., Economics, University College London
- M. Phil., Economics, University of Cambridge
- CFA Charterholder
- Member of the CFA Institute
- Fellow of the Royal Statistical Society

Objectives

1. Understand what statistics and econometrics is
2. Understand how and why techniques from these fields are increasingly relevant in commercial disputes
3. Identify circumstances in which these techniques could assist not only in assessing damages, but also factual causation and liability

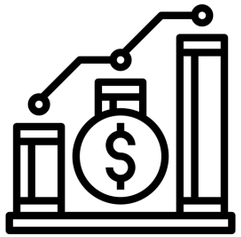
Contents

What are statistics and econometrics, and what do these fields have to do with damages?

What are statistics and econometrics?

Mathematical techniques that can be applied to data to help establish *and* quantify factual causation

Statistics: the study of collecting, analysing and presenting quantitative data



Econometrics: the application of statistical methods to study economic relationships

These disciplines allow us to use data to establish and quantify factual causation (did A cause B?)

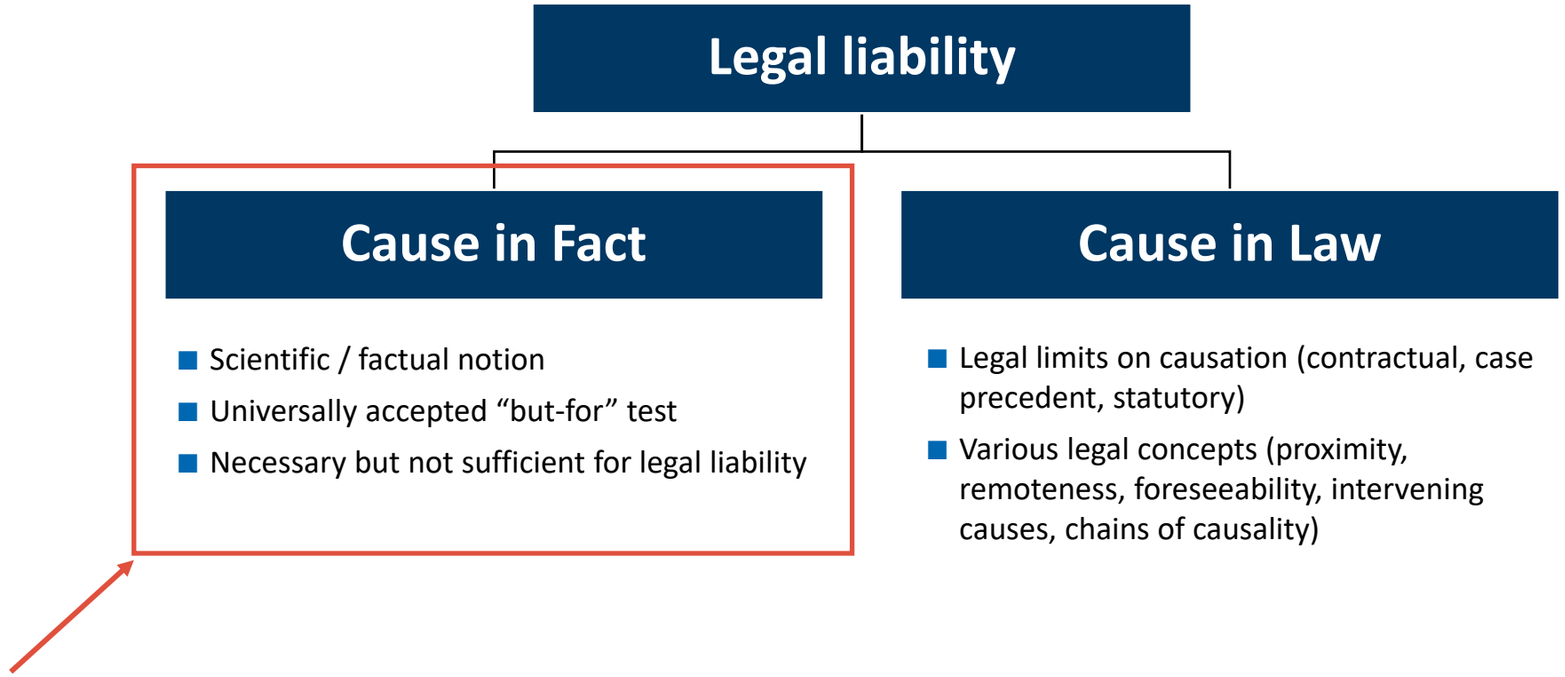
What does this have to do with commercial disputes?

There is rapid growth in the use of techniques from statistics and econometrics in expert evidence.

Legal practitioners involved in the dispute resolution process should understand (at least at a high level) what these techniques are, how they work, and when they can be applied in assessing liability and damages,

What does factual causation have to do with legal liability?

Techniques from statistics and econometrics can help in determining whether and to what extent there is a causal relationship between an action and a claimed harm.



Economic, statistical and econometric techniques are ideal for assessing Cause in Fact

What does factual causation have to do with assessing compensatory damages?

The object of an award for compensatory damages is to put the injured party in the same position as it would have been in, had it not sustained the wrong.

- This requires to translate the legal theory of the defendant's alleged misconduct, into an analysis of the economic impact of that alleged misconduct on the claimant:

Clearly understanding and defining the defendant's alleged misconduct

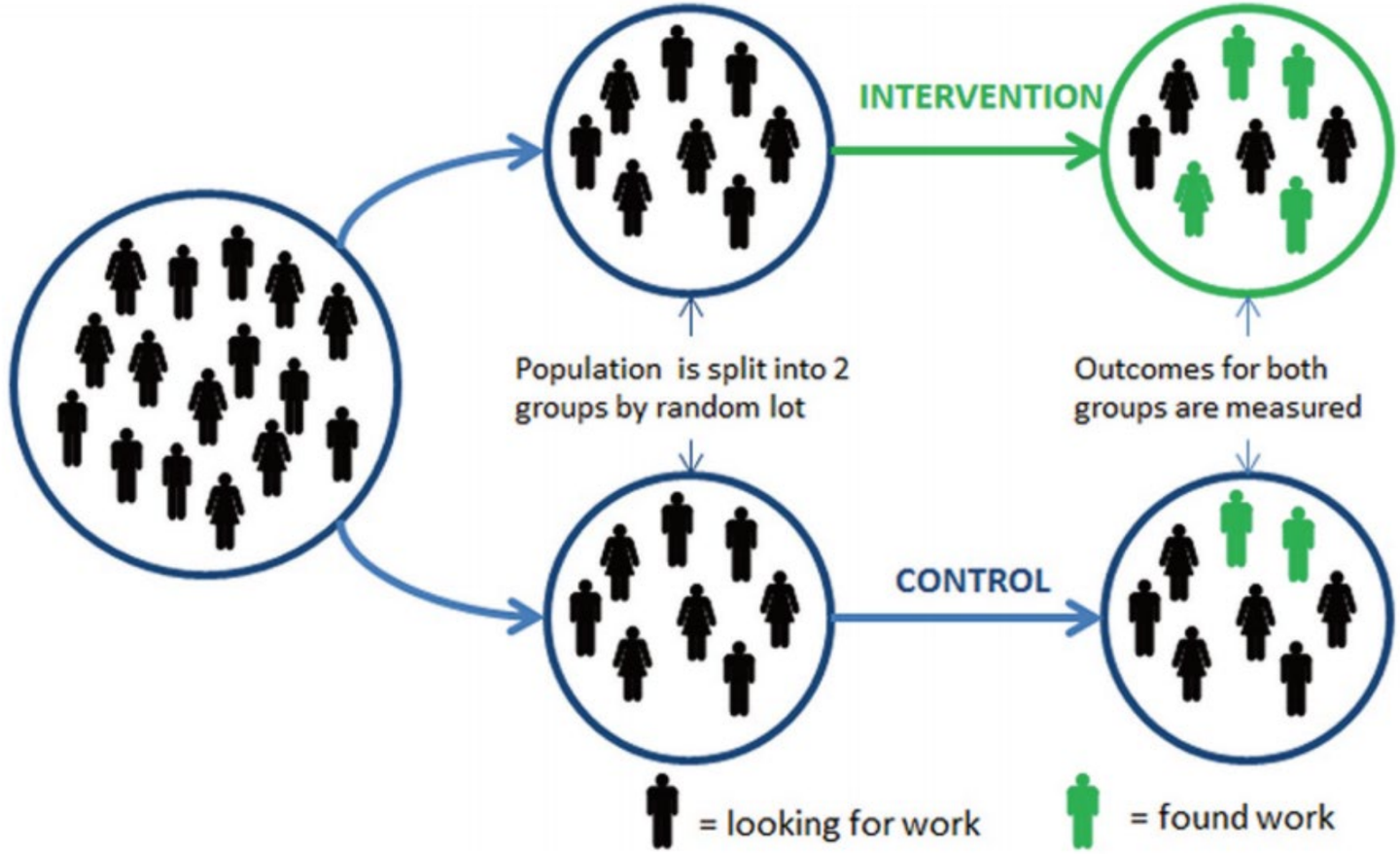
Identifying and quantifying the causal effect of the alleged misconduct on the claimant

Quantifying the financial implications of this causal effect, by assessing the difference between the claimant's financial position in an actual and but-for scenario

How do we measure cause and effect using data?

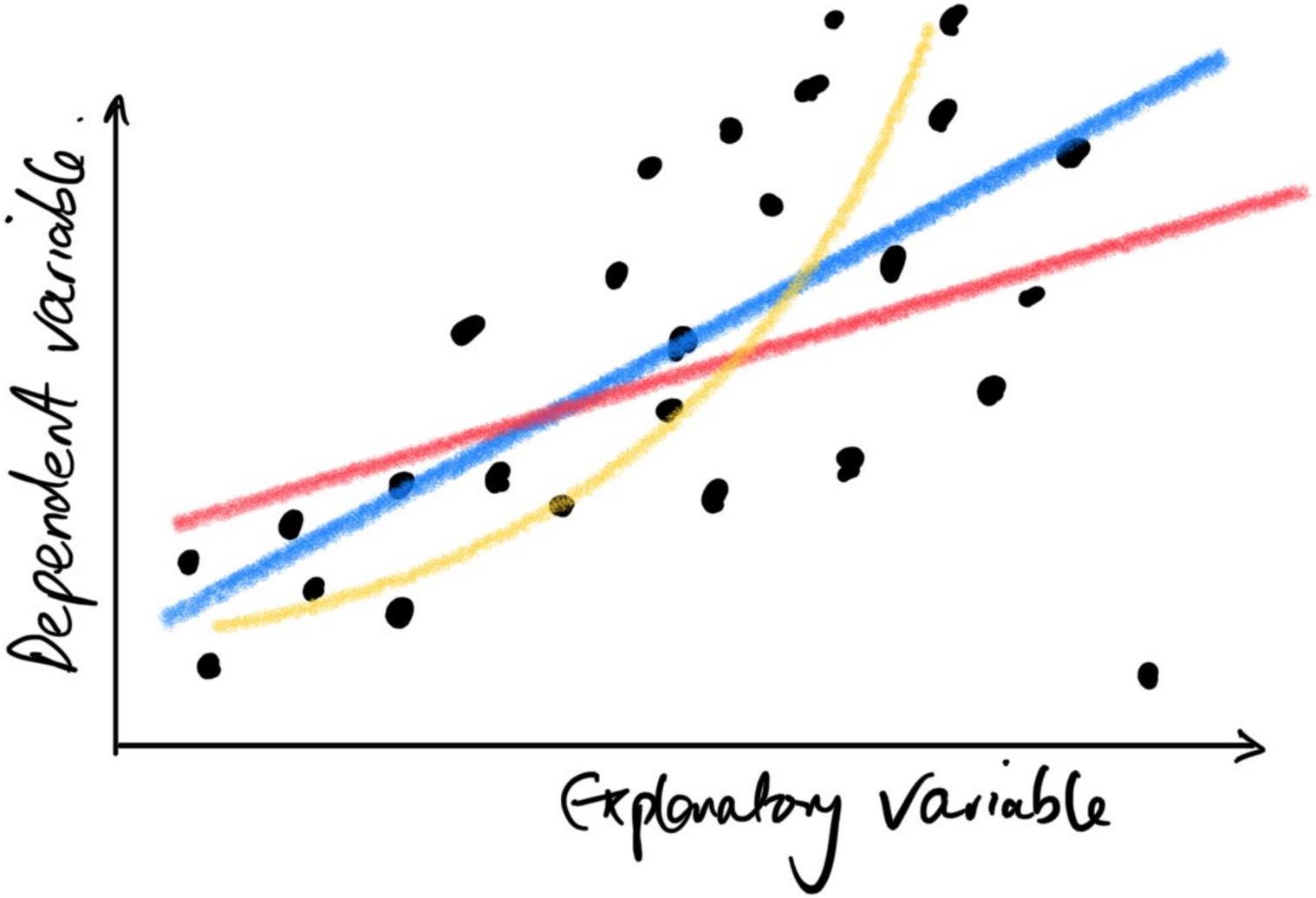
The gold standard for assessing causation is to use a ‘randomised control trial’ (RCT)

Observing the differences between the control and treatment groups (with appropriate statistical methods!) gives an estimate of the causal effect of the treatment.

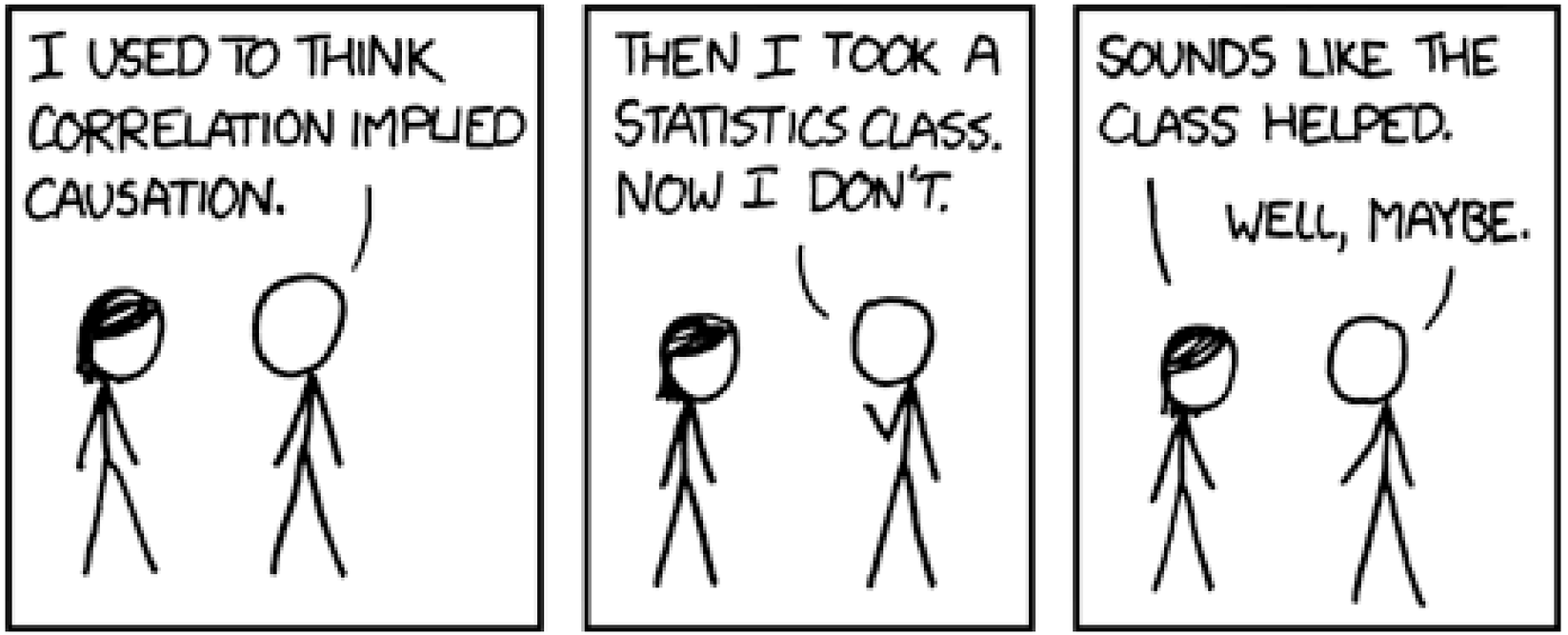


Source: “Test, Learn, Adapt”, UK Cabinet Office, Behavioural Insights Team, 2012

Regression is a statistical technique used to draw a ‘line of best fit’



Correlation is not causation



Source: xkcd.com

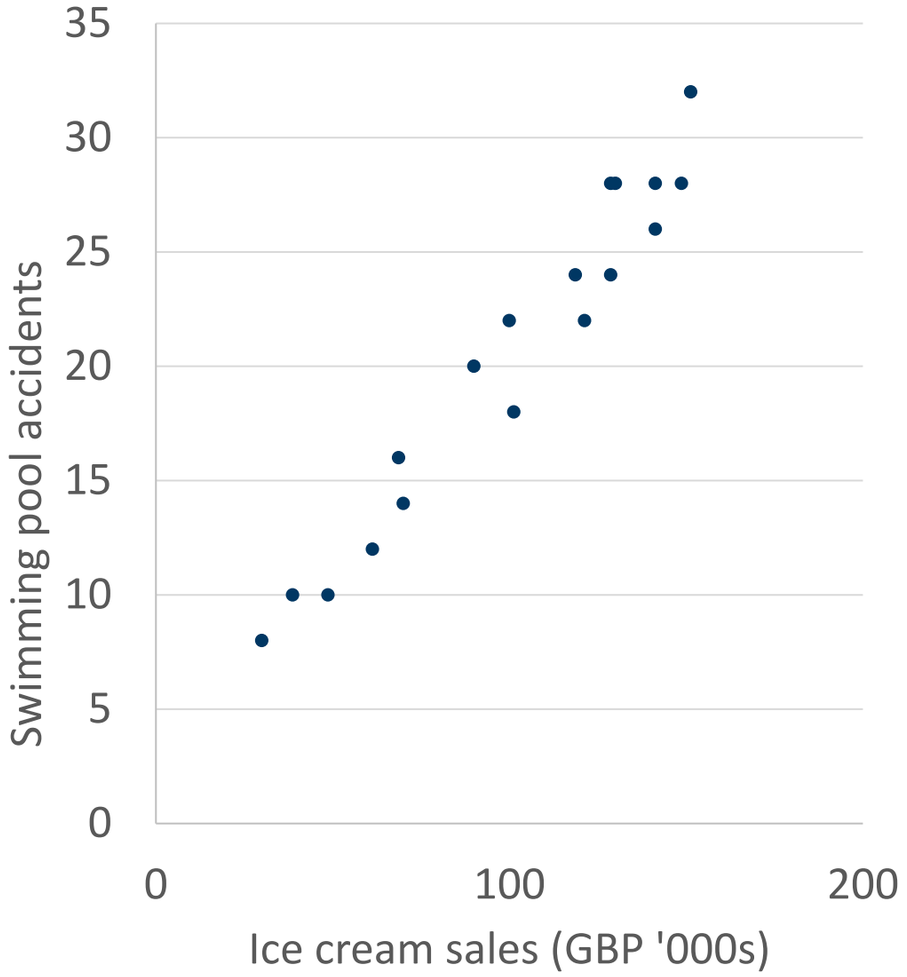
In practice, ‘multivariate regression’ can be used with observational (‘real world’) data

Exercise 1: The relationship between ice cream sales and swimming pool accidents

- The chart on the right plots data for the ice cream sales and the number of swimming pool related accidents in each month, in a surprisingly dangerous sea-side town.

- The charts shows a strong and positive correlation between the two. A local tabloid newspaper presents this chart under a headline: "**Killer ice cream!**"

- Questions:
  1. Why could the headline be misleading?
  2. What is a more plausible explanation for the relationship seen in the chart?



Exercise 1: Suggested answers

- Questions:

1. Briefly explain why the reasoning in the headline is fallacious.

—*Correlation does not imply causation.*

—*For example, there might a third factor that causes both ice cream sales and accidents to move in line.*

2. Write down a plausible explanation for the relationship shown in the graph.

—*In the warmer months, more individuals visit swimming pools, leading to more swimming pool accidents. At the same time, more ice cream is consumed during warm weather.*

Case study 1:
The real-world effects of ‘fake news’

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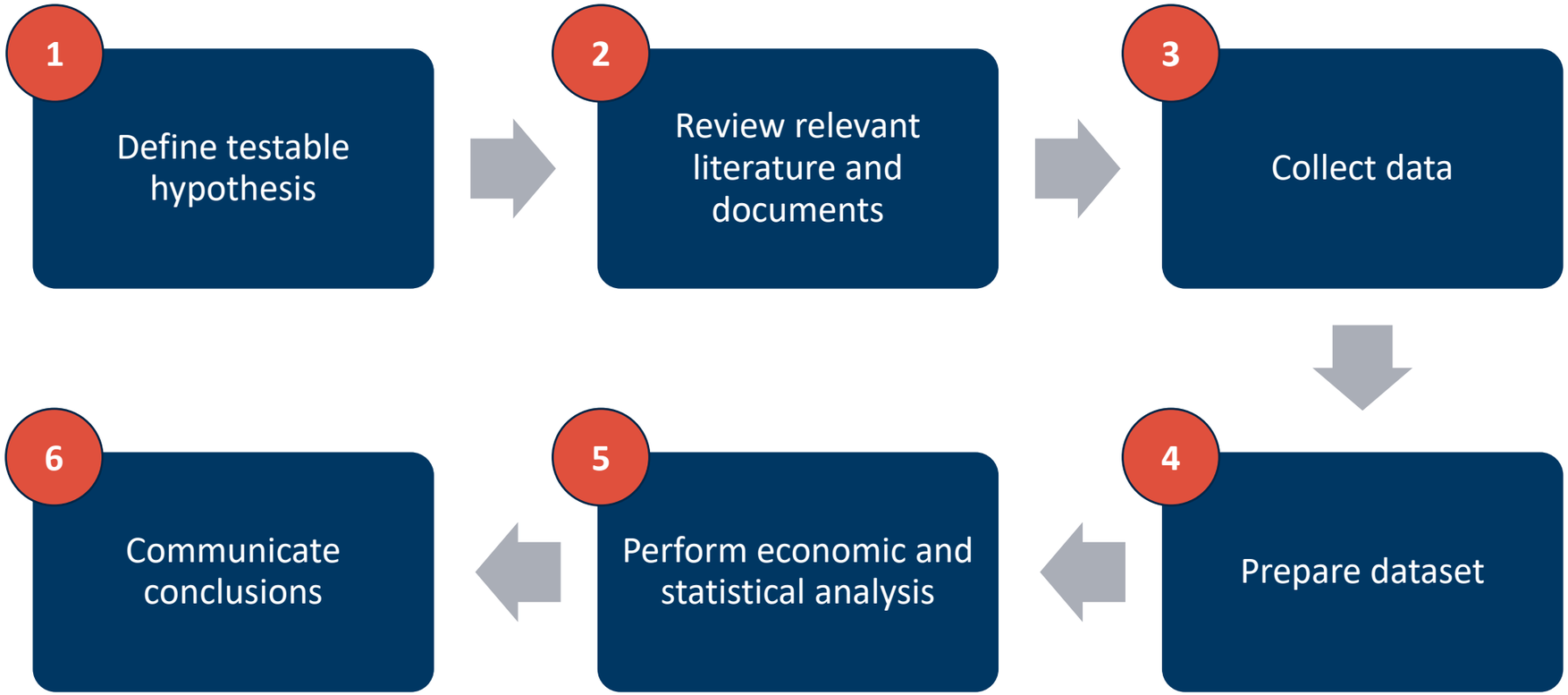
Assessing the impact of ‘fake news’ on vaccination rates

Conspiracy theories about vaccines have been around for as long as vaccines themselves – but what is the impact of such conspiracy theories today?

“The cow-pock or the wonderful effects of the new inoculation!”, by James Gilray, 1802.

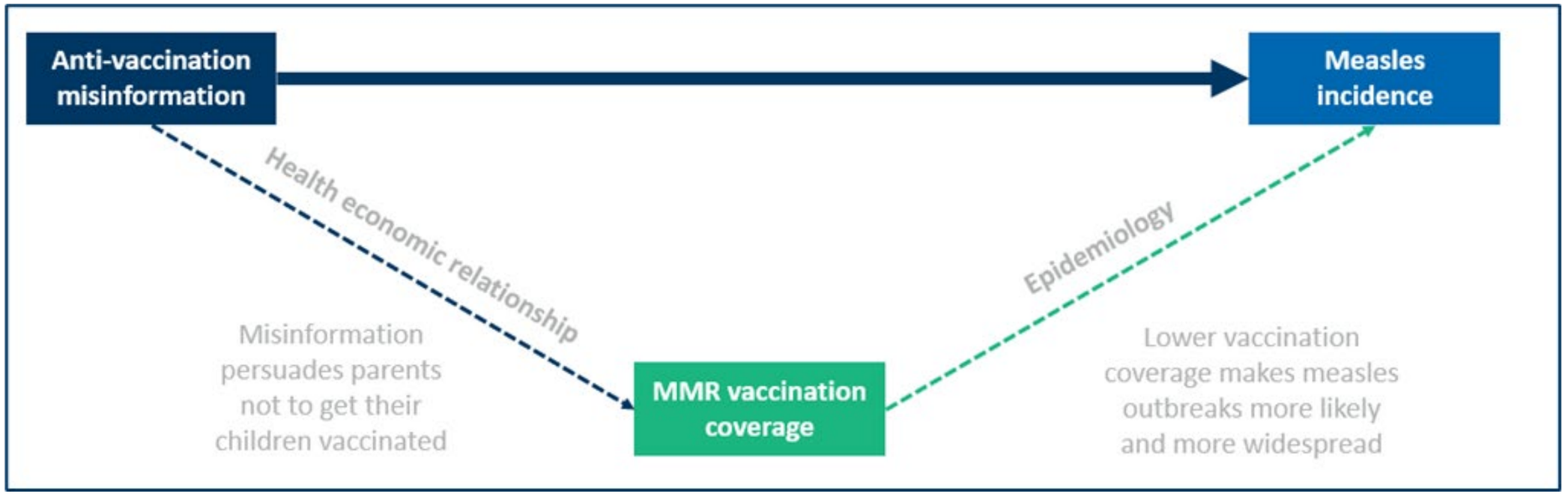
Our approach

Our approach follows a classic method of scientific inquiry: we form a hypothesis and test it with data.



Step 1: Define testable hypothesis

In this example, we have two testable hypotheses:



Step 2: Review relevant literature and documents

In this example, we call upon both medical and economics literature relevant to vaccination. This helps us to identify key factors that would be important to control for in our analysis

Epidemiological research

Public health economics research

Research underlying our analysis

Step 3 and 4: Collect and prepare data

Having reviewed the literature, we collect the raw data needed for our analysis

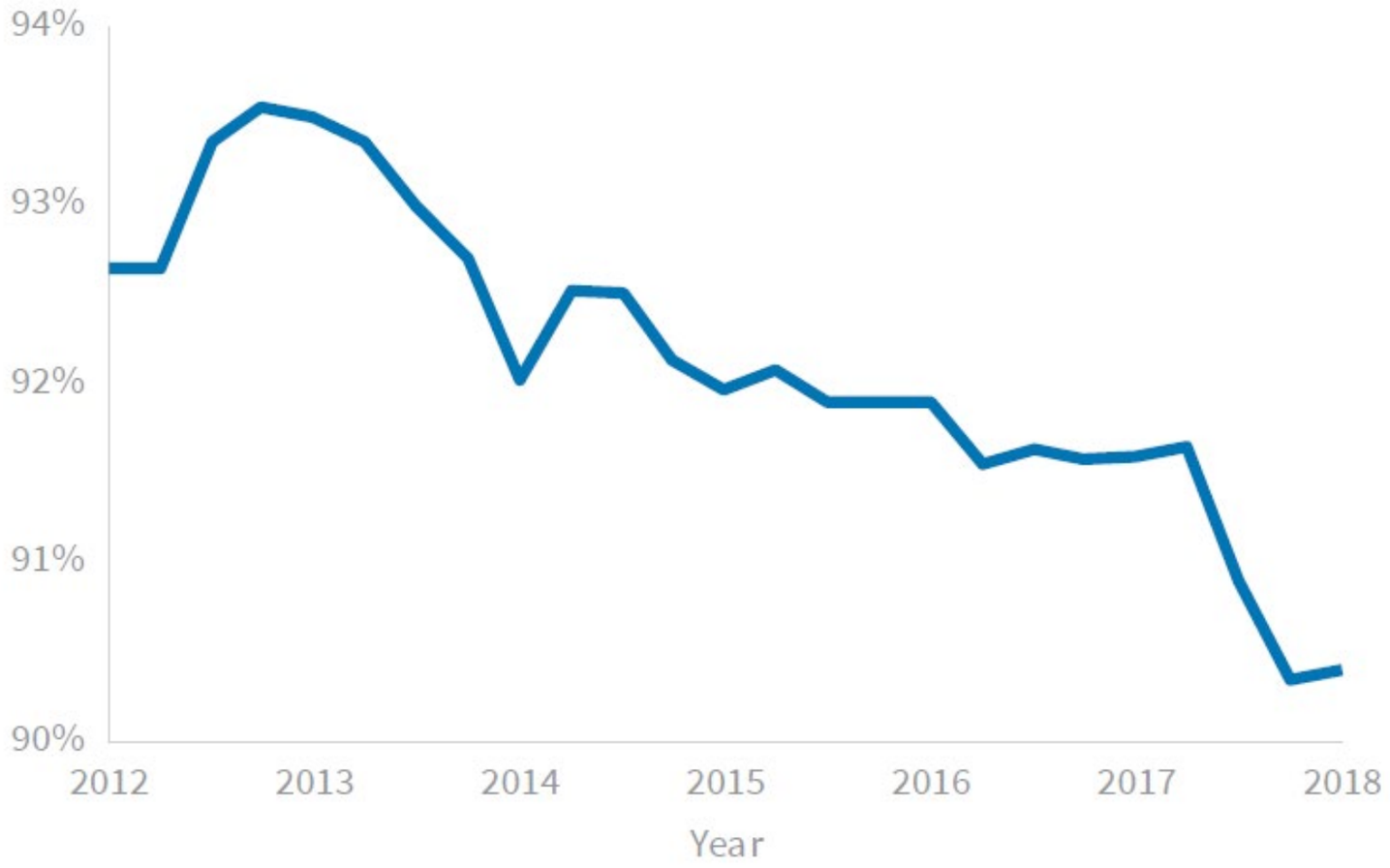
The dependent variable: MMR vaccination rates across the UK

The main explanatory variable: the extent of fake news on Twitter

Confounding factors: various demographic characteristics

Step 3 and 4: Collect and prepare data

MMR vaccination coverage across England and Wales has been falling over time



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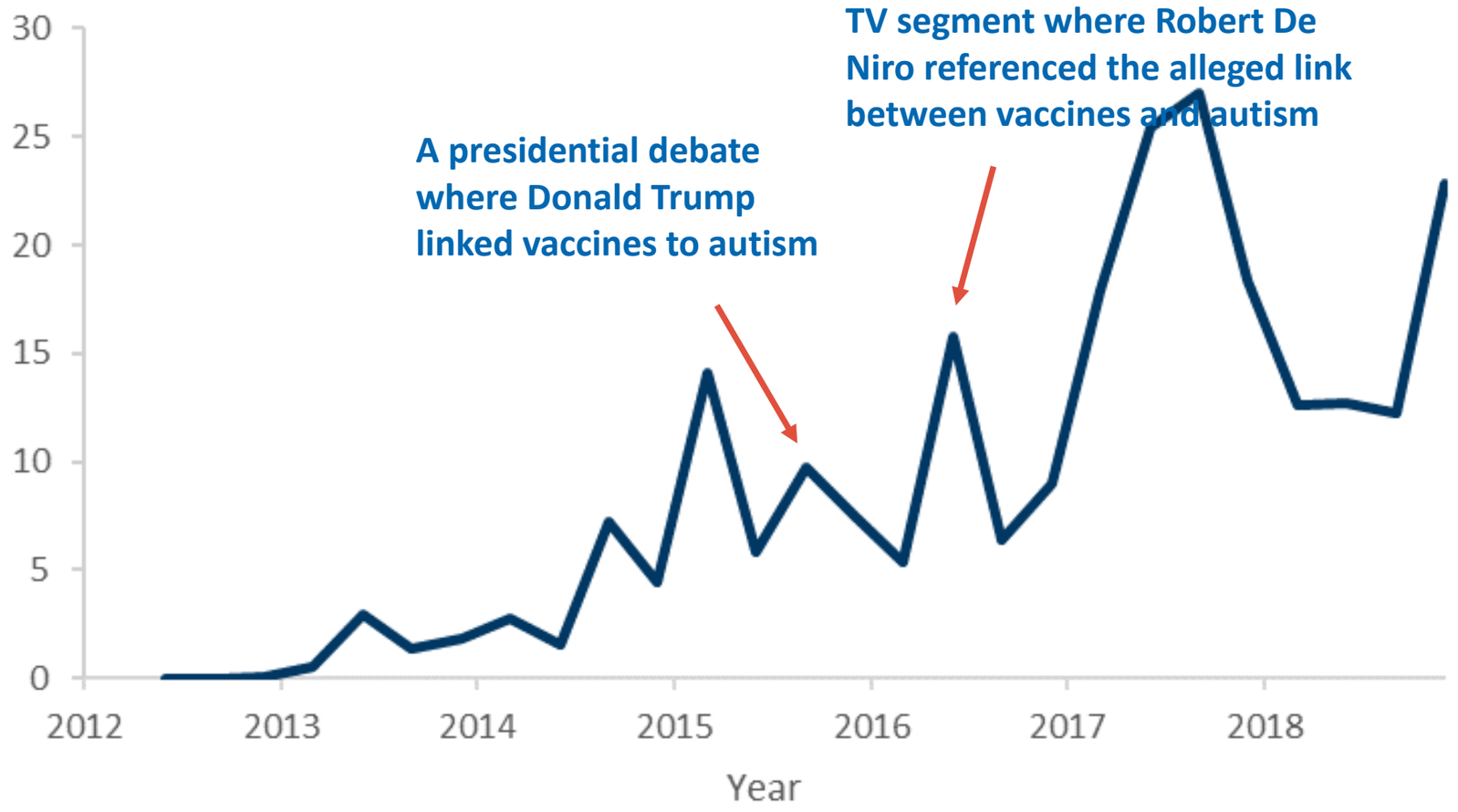
Step 3 and 4: Collect and prepare data

We then used a 'machine learning' algorithm to classify Tweets according to whether they contain misinformation, or not. We then translated this classification into a statistical index of misinformation



Step 3 and 4: Collect and prepare data

Having reviewed the literature, we collect the raw data needed for our analysis

The dependent variable: MMR vaccination rates across the UK

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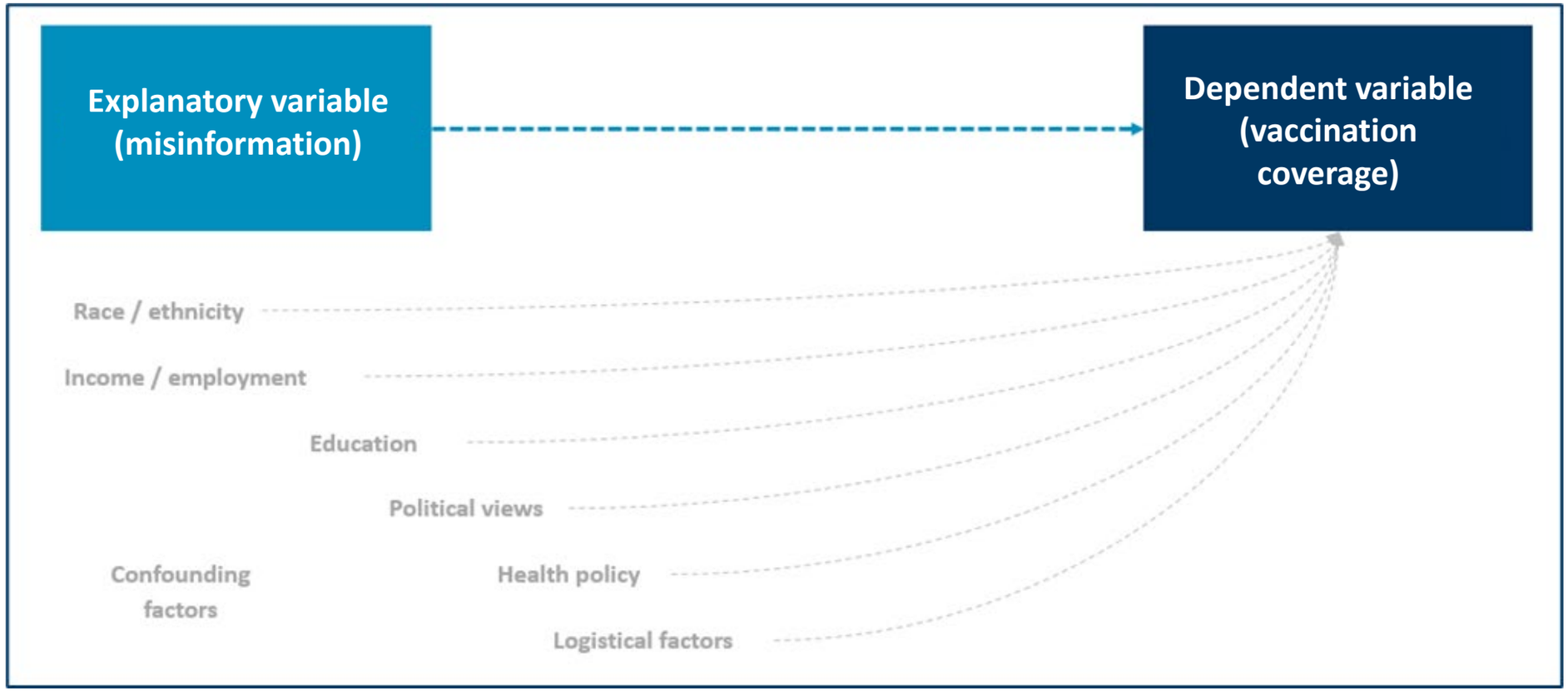
Confounding factors: various demographic characteristics

Step 5: Perform economic and statistical analysis

Finally, we develop a multivariate regression model in order to isolate the effect of the misinformation from the effect of other factors



Step 6: Communicate conclusions

Our analysis suggests that misinformation has a statistically significant causal effect on vaccination rates

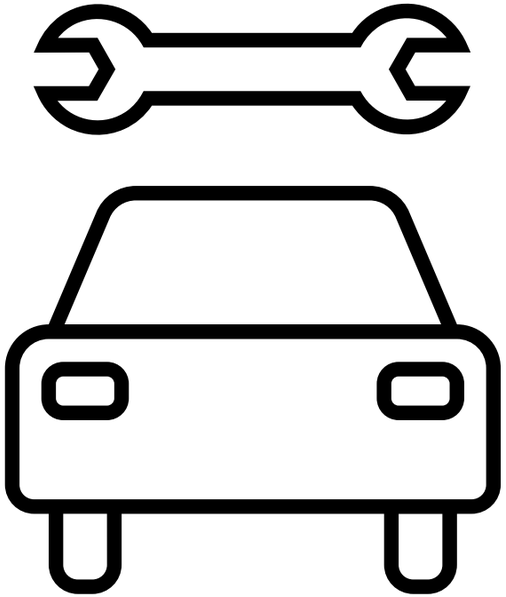
- When our measure of misinformation increases (e.g. by 100%, i.e. it doubles), this causes vaccination coverage to fall (by about 0.20 percentage points, on average).

- Over the 5-year period from 2014-2018, misinformation increased by approximately 800%. Vaccination coverage fell by approximately 3 percentage points, and our regression analysis suggests that over half of this fall may be due to misinformation.

- The real-world effects of 'fake news' – and how to quantify them, Society for Computers and Law, Computers & Law magazine, August 2020

Exercise 2: Determining whether a Defendant is liable for manufacturing a faulty component

- MotorCorp, a car manufacturer, is suing one of its suppliers, Transmissions'R'Us, for supplying a faulty transmission unit.
- This transmission unit is only used in MotorCorp's latest car model, the Lightning, which is breaking down more frequently than MotorCorp's older models.
- MotorCorp alleges the additional breakdowns in the Lightning are caused by a faulty transmission unit from Transmissions'R'Us.



- Questions:

1. Write down some alternative explanations for why Lightning cars might break down more frequently than the other MotorCorp models.
2. List some of the potential confounding factors you would need to account for when determining if the breakdowns are caused by a faulty Transmissions'R'Us product.

Exercise 2: Suggested answers

- Questions:

1. Write down some potential alternative explanations for why Lightning cars might break down more frequently than the other MotorCorp models.
   - *The Lightning may have other faulty components, produced by other suppliers, that are not present in older models by MotorCorp*
   - *The Lightning may have an inferior design (as it is an experimental sports car) which makes it more prone to breaking down than older models*
   - *The transmission unit may be incorrectly installed in the Lightning due to the fact that MotorCorp engineers are not used to working with it yet*
   - *The Lightning may be targeting a riskier consumer than older models – e.g., sports car / high speed enthusiasts who push their vehicles more, causing more breakdowns*

Exercise 2: Suggested answers

- Questions:

2. List some of the confounding factors you would need to account for when determining if the breakdowns are caused by a faulty Transmissions'R'Us product.
   - *Quality of other components*
   - *Quality of the design*
   - *Quality of the manufacturing*
   - *Quality of the installation process of the transmission units*
   - *Driver behaviour*

Case study 2:
Measuring the causal impact of point-of-sale display bans for cigarettes on smoking

Phillip Morris Norway vs Norwegian Government on point-of-sale display bans for cigarettes

- Point-of-sale display bans are policies aimed at reducing smoking. They have been litigated in various jurisdictions, with tobacco companies claiming the bans are ineffective at reducing smoking
- We were instructed in one such litigation (Philip Morris Norway v. Norwegian Government, represented by Ministry of Health and Care Services) to assess causal effect of point-of-sale display bans, implemented in Norway in 2010, on cigarette sales.

Exercise 3: Determining the likely impacts of a new tobacco control policy (point-of-sale display bans)

- Questions:

1. How and why might a point-of-sale display ban be effective for reducing smoking?

2. How and why might this policy be ineffective for reducing smoking?

3. How might this policy backfire, and instead lead to an increase in smoking?

Exercise 3: Suggested answers

- Questions:

1. How and why might a point-of-sale display ban be effective for reducing smoking?
   - *By making cigarettes less visible, the policy may have an "out of sight, out of mind" effect. Consumers, both smokers and non-smokers, will be less tempted to buy cigarettes if they are not reminded of them when shopping. This in turn may lead to lower overall smoking.*

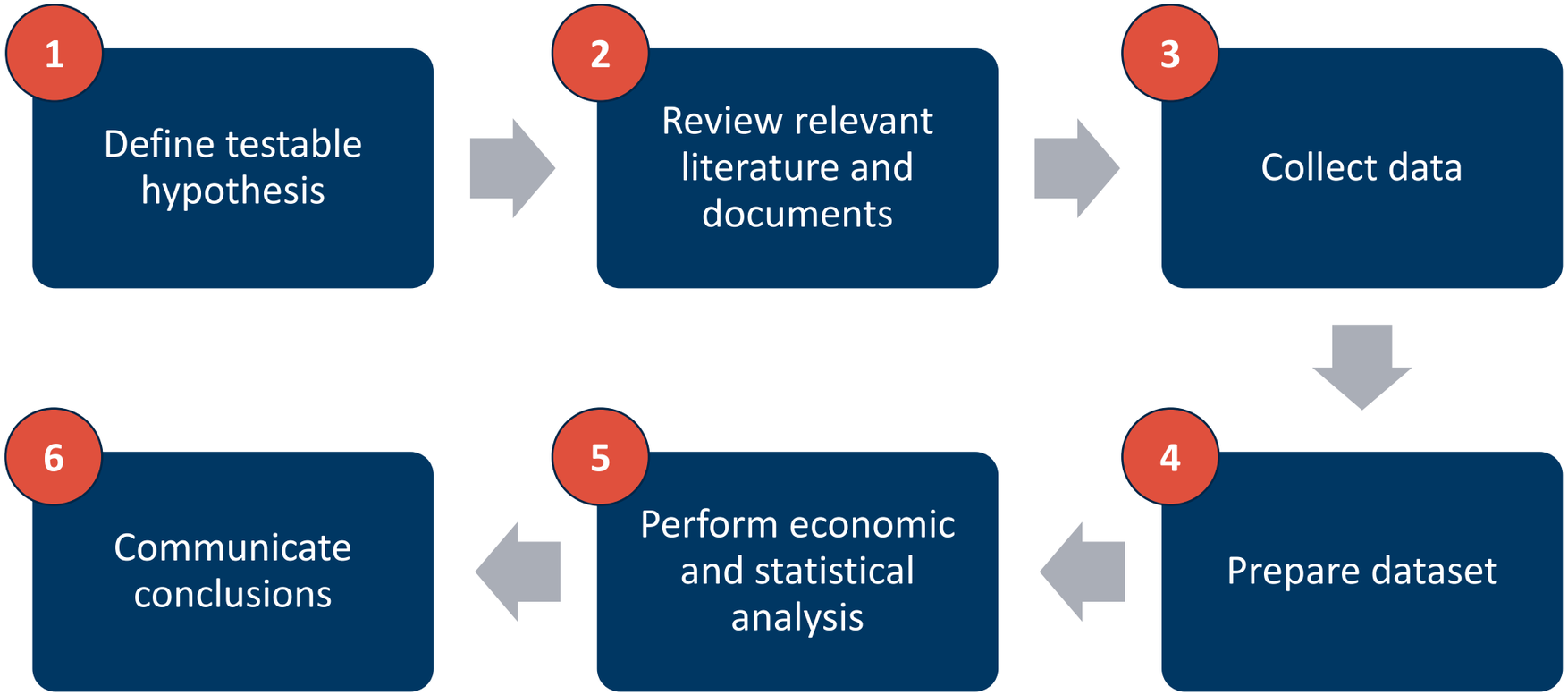
2. How and why might this policy be ineffective for reducing smoking?
   - *The policy might be ineffective for two reasons. First, people who are already addicted to smoking will crave cigarettes, regardless of whether they see them on display in shops or not. Second, the policy only impacts displaying cigarettes in shops. However, smoking may still be visible in many other social settings, such as outdoor cafes and pubs. Thus, the policy might have little impact on the actual overall visibility of smoking in society.*

Exercise 3: Suggested answers

- Questions:

3. How might this policy backfire, and instead lead to an increase in smoking?
   - *Consider that hiding cigarettes behind black screens in shops may make the product look forbidden and "cool"; this in turn may increase its appeal among impressionable youth and cause higher youth smoking.*
   - *Furthermore, increasing the regulatory burden on cigarettes may cause the illicit market for cigarettes to grow and become more socially accepted. Illegally sold cigarettes may be cheaper, as seller do not pay taxes on them, leading to an overall increase in cigarette consumption.*

Our approach followed the same 6 steps



Step 1: Define testable hypothesis

In this case, the policy rationale assumes a causal relationship: POSD bans will reduce cigarette consumption.

Out of sight, out of mind (…out of mouth?)

Example from UK:

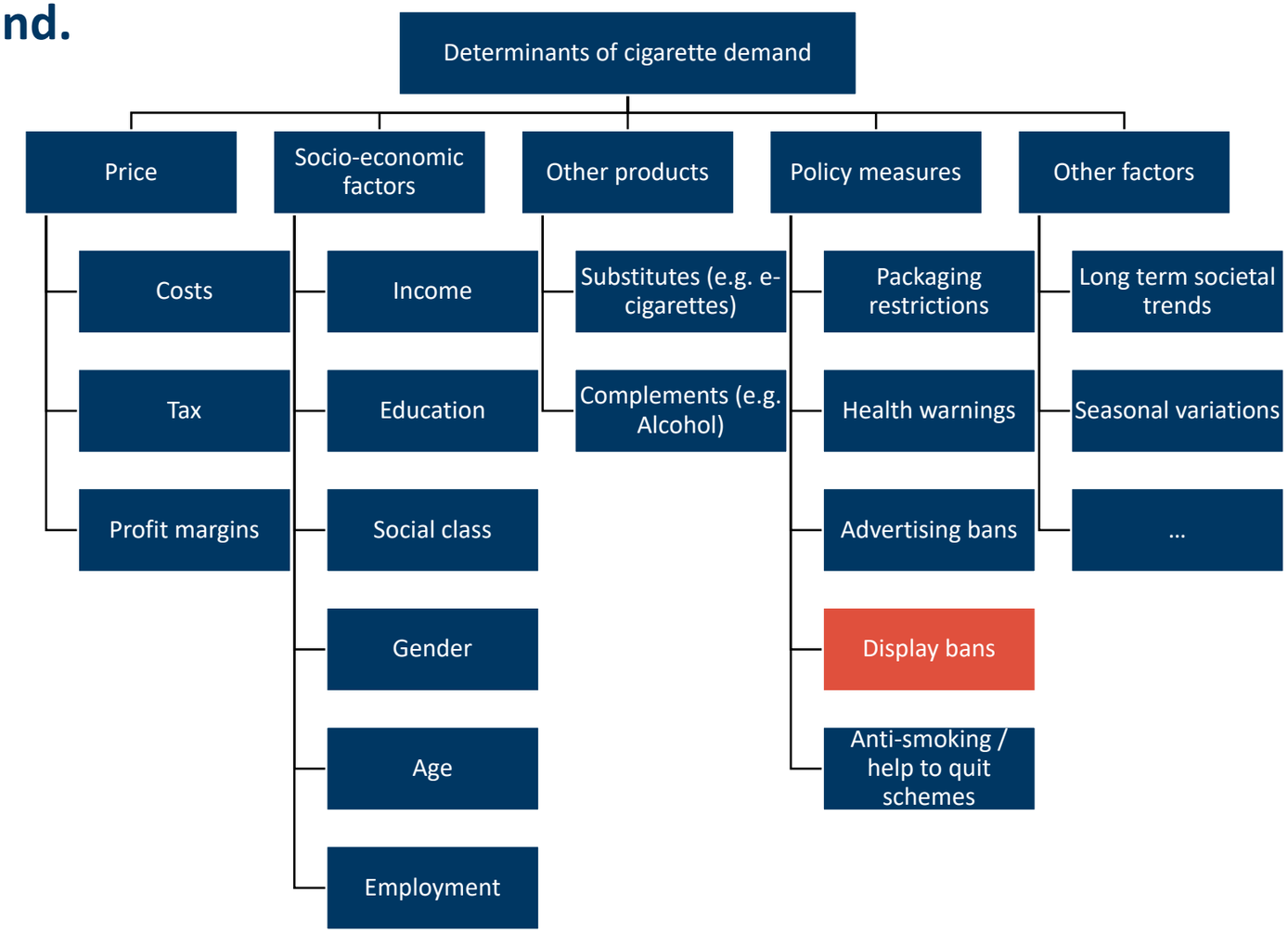
> *"[A tobacco display ban] reduces the visibility of tobacco and smoking to young people. And, of course two-thirds of smokers started smoking before they were eighteen….**So, if we can, literally, arrive at a place where young people just don't think about smoking and they don't see tobacco and they don't see cigarettes - then I hope we can make a big difference**"*
>
> Andrew Lansley, Secretary of State for Health, 2012

Example from Norway:

> *"The ministry emphasises that the proposed ban is an important element in a larger package of measures **aiming to reduce and prevent the harmful effects of tobacco**"*
>
> Unofficial translation of Oslo District Court Judgement, in Philip Morris Norway v. Norwegian Government

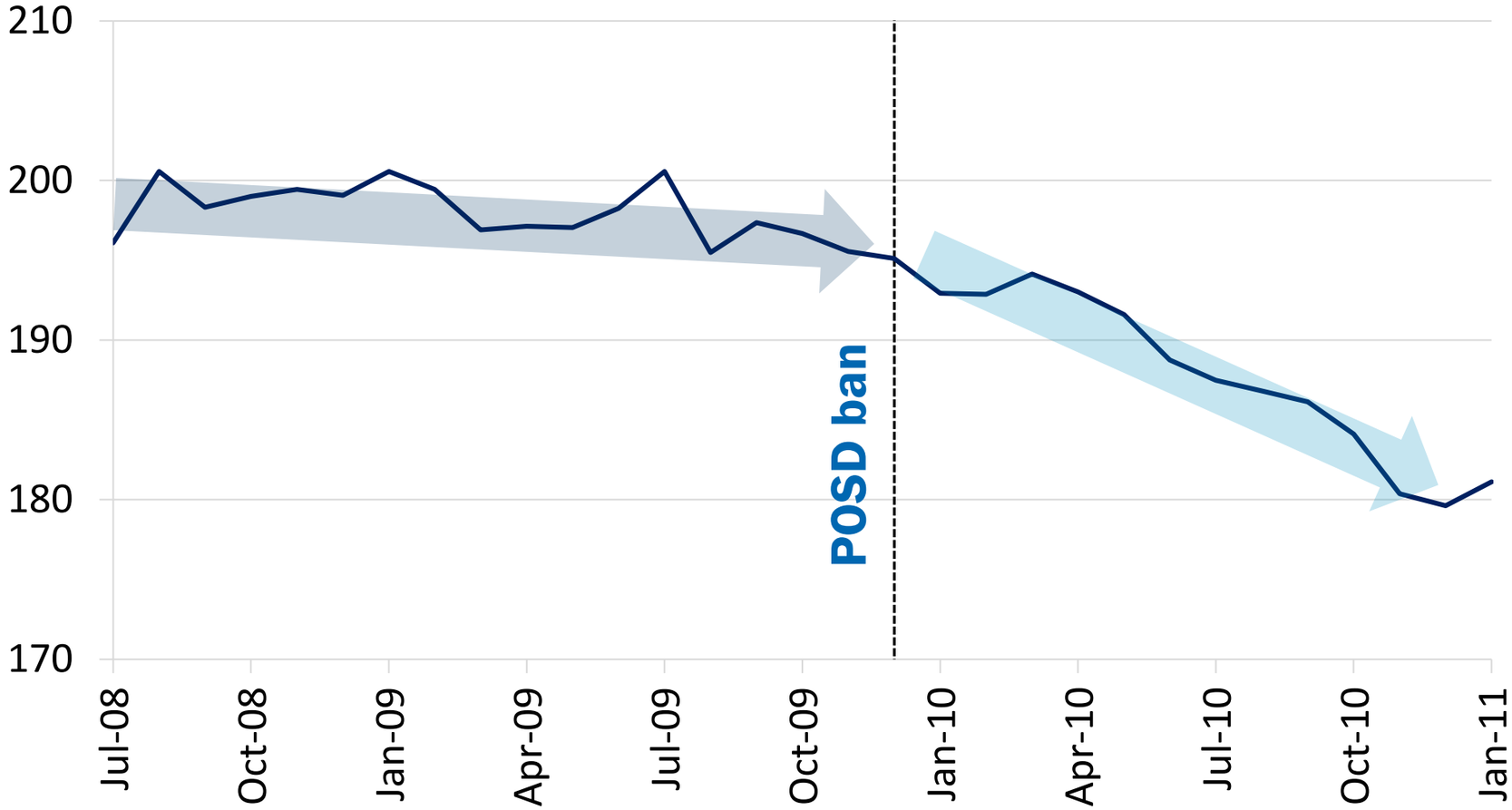
Step 2: Review relevant literature and documents

Health policy and tobacco economic literature identifies many different factors that can affect cigarette demand.



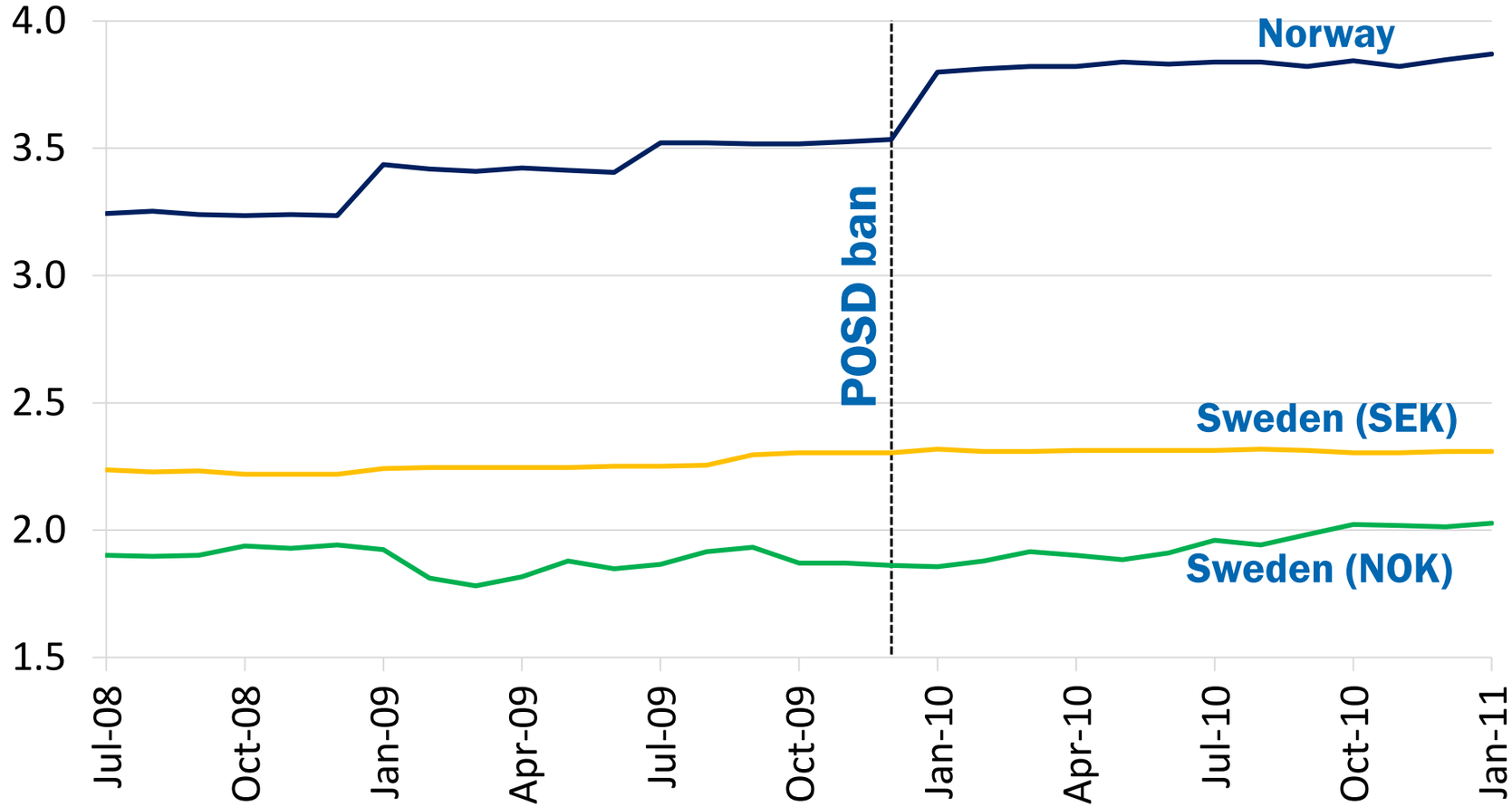
Step 3 and 4: Collect data and prepare dataset

We collect public data on the relevant factors. Retail cigarette sales fell following introduction of POSD ban (millions cigarettes/month)…



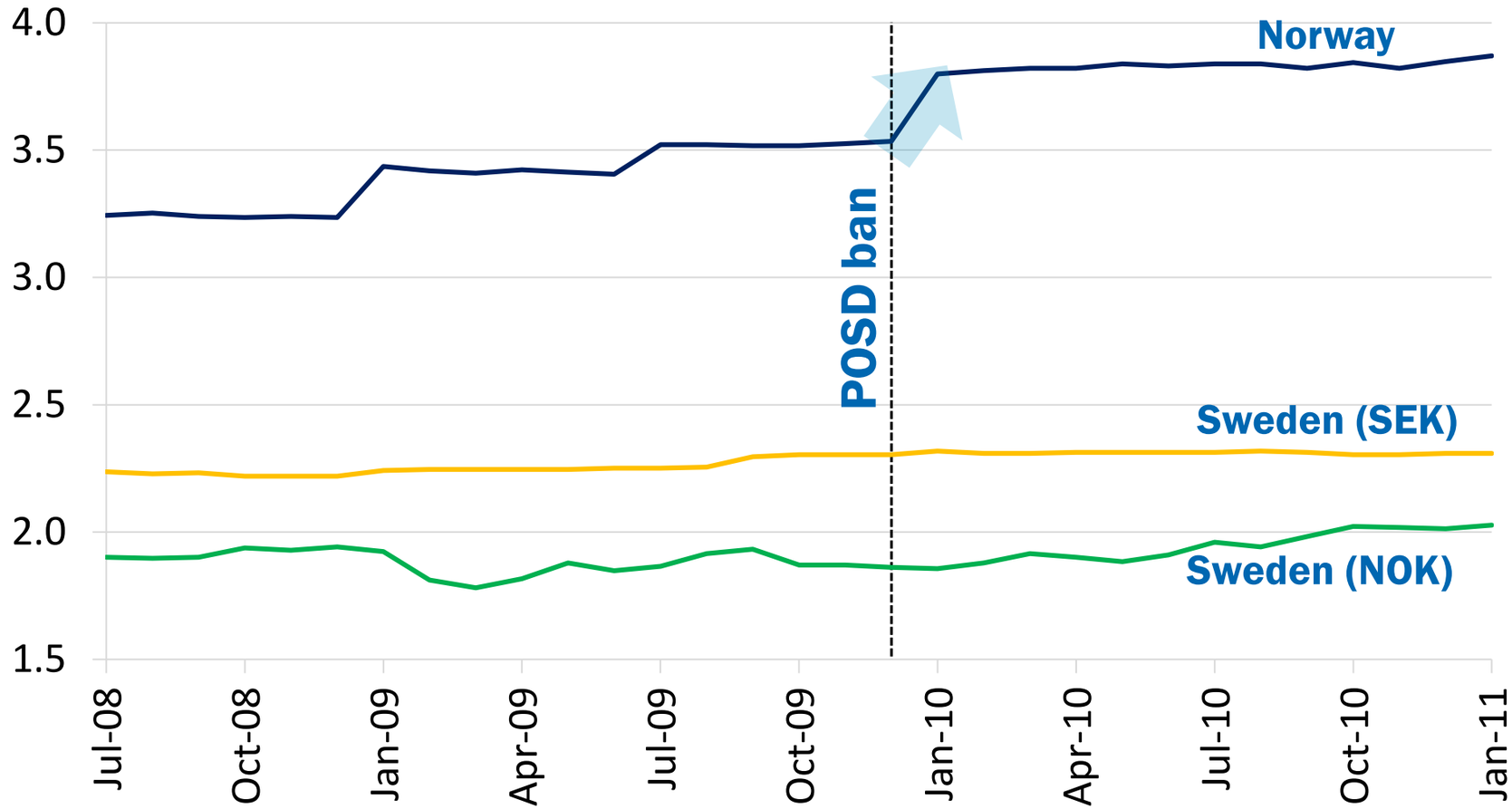
Step 3 and 4: Collect data and prepare dataset

From this graph of cigarette tax (NOK/cigarette) over time, can you identify any other factors that may have caused smoking rates to fall?



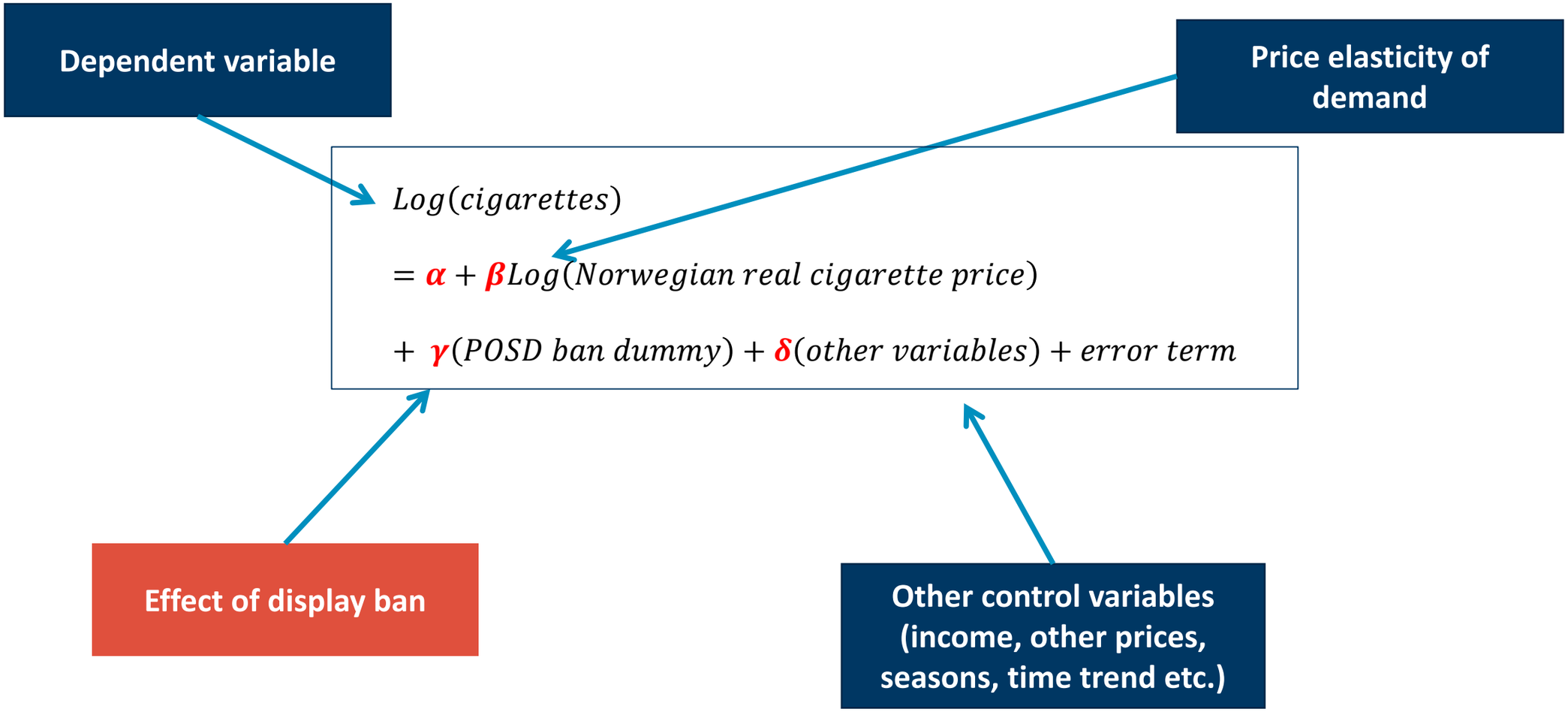
Step 3 and 4: Collect data and prepare dataset

Cigarette taxes increased at the same time, leading to higher average prices (NOK per cigarette).



Step 5: Perform economic and statistical analysis

We develop a multivariate regression model (represented by the mathematical equation below), designed to isolate the causal effect of the POSD ban from other confounding factors.



Steps 5 and 6: Perform economic and statistical analysis, and communicate conclusions

Our analysis suggested that the fall in sales is not caused by the POSD ban, but by the tax rise.

Key findings

- Price is the most important factor affecting cigarette consumption in Norway: consumption decreases as price increases. The price coefficient is highly statistically significant
- There is no evidence that that the POSD ban has affected demand – the coefficient on the POSD dummy is not significant
- There is a significant non-linear trend in consumption
- The variables included in the regression explain 94% of the variation in sales

Key takeaways

Three key takeaways

Legal liability and compensatory damages both require establishing factual causation.

When multiple factors may have caused an alleged harm, and data is available on these factors, statistics and econometrics are powerful tools for establishing and measuring factual causation.

Whenever a claim for damages assumes an alleged act caused harm, consider whether the claimant is confusing correlation with causation, and if statistics and econometrics could produce a more reliable estimate of damages.

Contact details

Dr Meloria Meschi

meloria.meschi@fticonsulting.com

+44 7545 301 465

Ravi Kanabar

ravi.kanabar@fticonsulting.com

+44 20 3727 1280