Assessing the impact of a regulatory change on import behaviours

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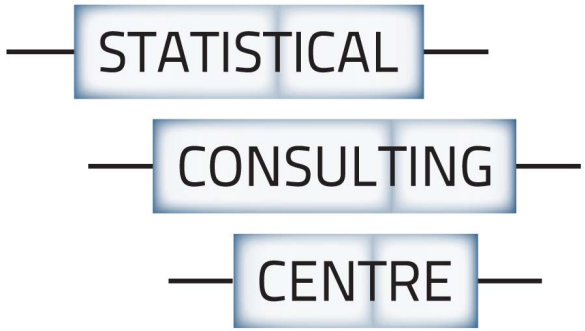

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Some project examples

- Text mining of customs goods descriptions
- Risk factor detection for international vessels
- Spatial mapping of international mail interceptions
- Development of performance indicators for cargo compliance

The impact of a regulatory change on fish imports

- In March 2016, Australia introduced a new policy on the importation of fish
- It impacted three varieties of fish: gourami, poeciliid and cichlid
- DAWR sought to assess whether this had impacted importation practices.
- Considering period March 2012 to February 2017

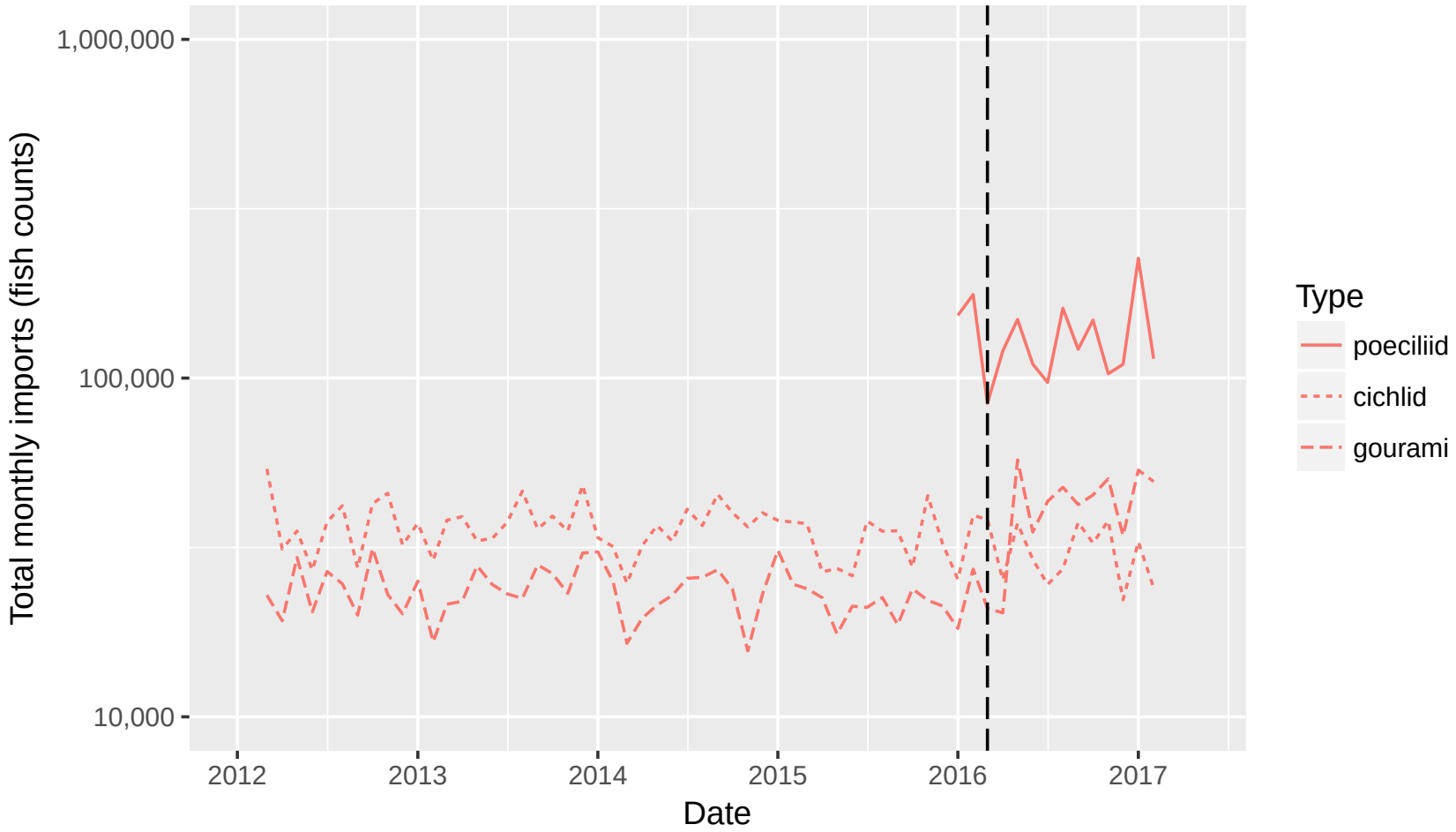
Fish import data

Consignment level data, including:

- date of consignment
- region of entry
- country of origin
- importer and exporter information
- counts of each fish type

$\rightarrow$ aggregated to monthly totals

Fish import data

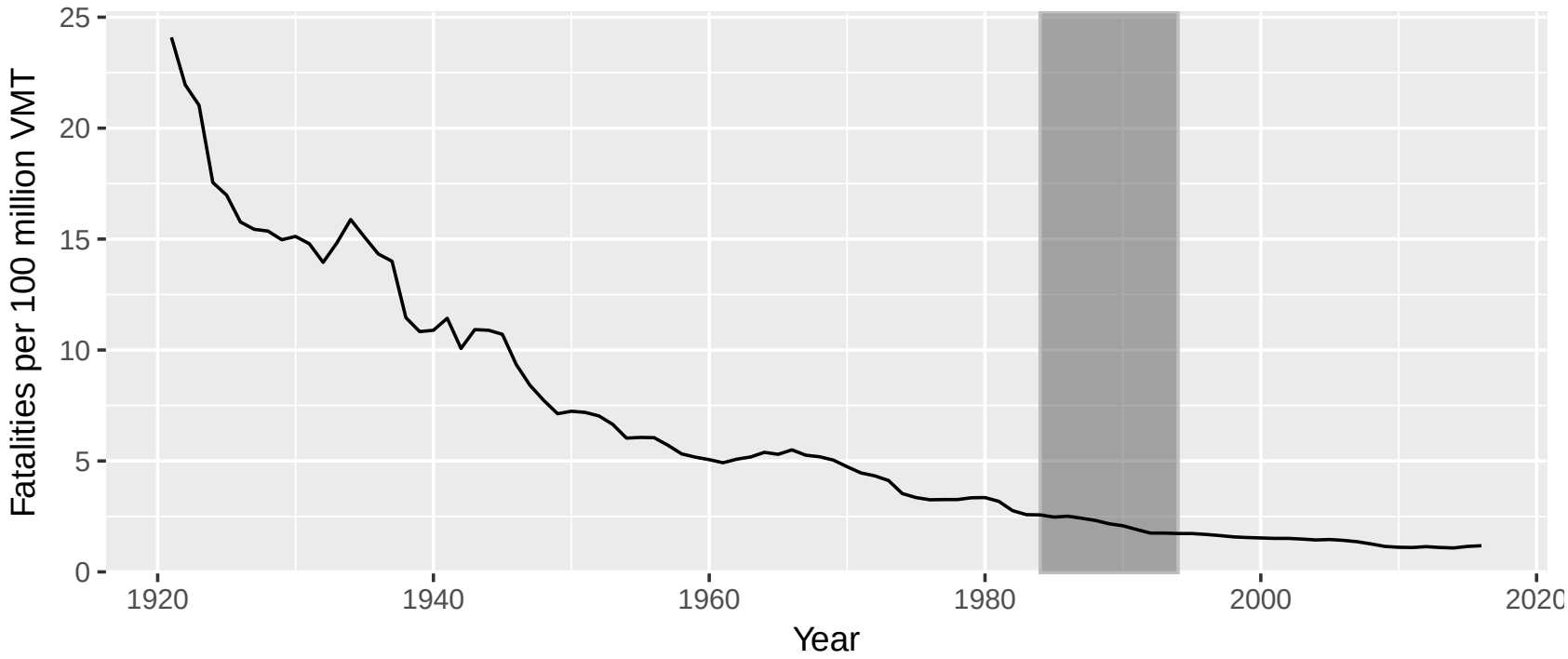


Fish import data

The impact of a regulatory change on road fatalities

- Seatbelt use became compulsory in Australia in the early 1970s
- The first US state to enforce seatbelt use was New York in 1984
- Most US states had some kind of seatbelt use law by 1993
- The impact of these laws on road safety, specifically fatalities, is a much studied area

How can we be sure of the impact?



How can we be sure of the impact?

- Randomise of the impact
- Find control groups or periods
- Choose a suitable model
- Adjust for other variables

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  $\rightarrow$ the stuff of dreams
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How can we be sure of the impact?

- Randomise of the impact
- Find control groups or periods
  $\rightarrow$ control types, before/after
- Choose a suitable model
- Adjust for other variables

How can we be sure of the impact?

- Randomise of the impact
- Find control groups or periods
- Choose a suitable model

  $\rightarrow$ capturing underlying effects
- Adjust for other variables

How can we be sure of the impact?

- Randomise of the impact
- Find control groups or periods
- Choose a suitable model
- Adjust for other variables

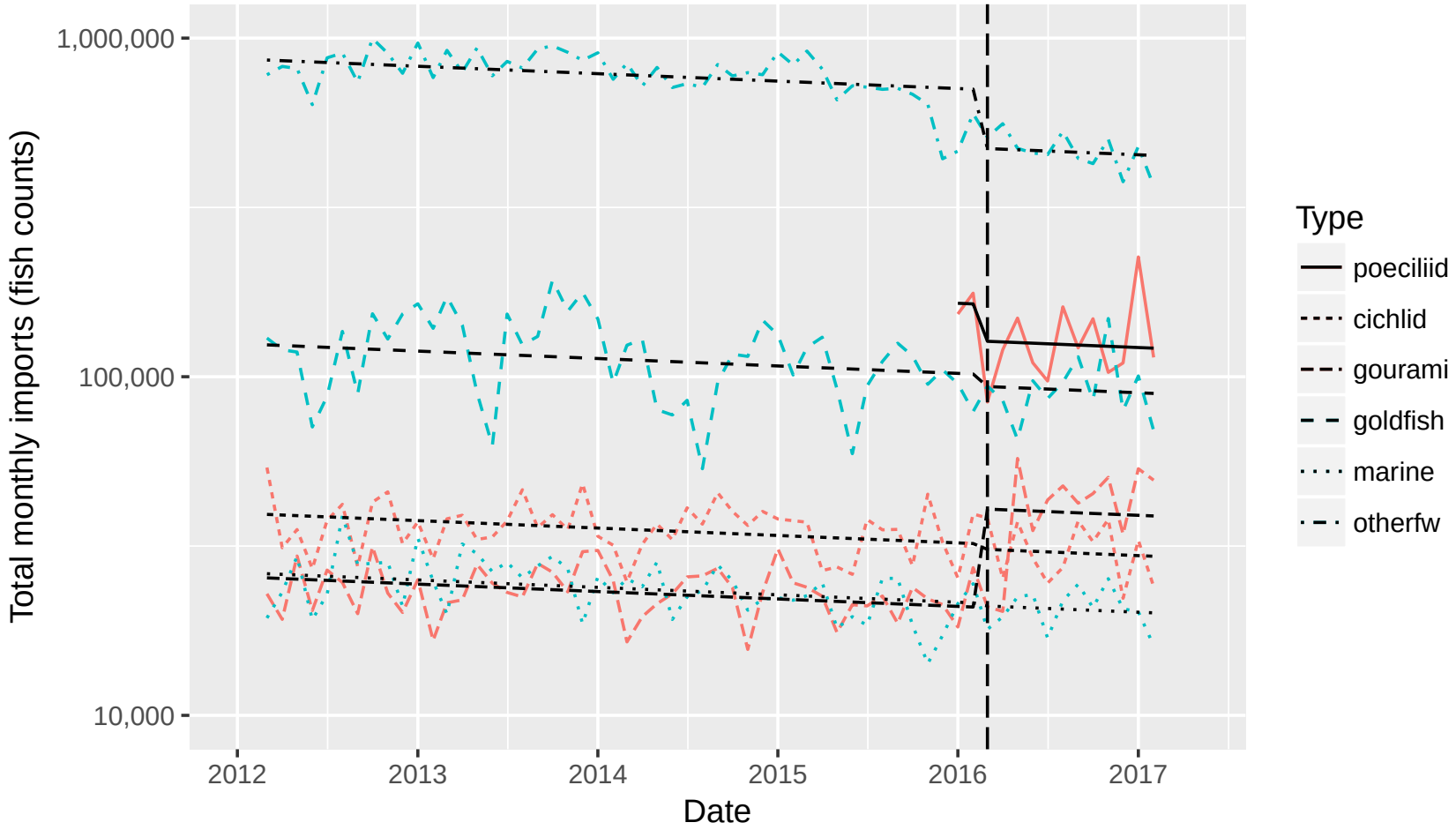
$\rightarrow$ eliminating confounders

Fish import data

Detecting a mean change

- Linear model on log-transformed monthly counts
- Month included to allow for long term trend
- Interaction between fish type and policy change

Detecting a mean change



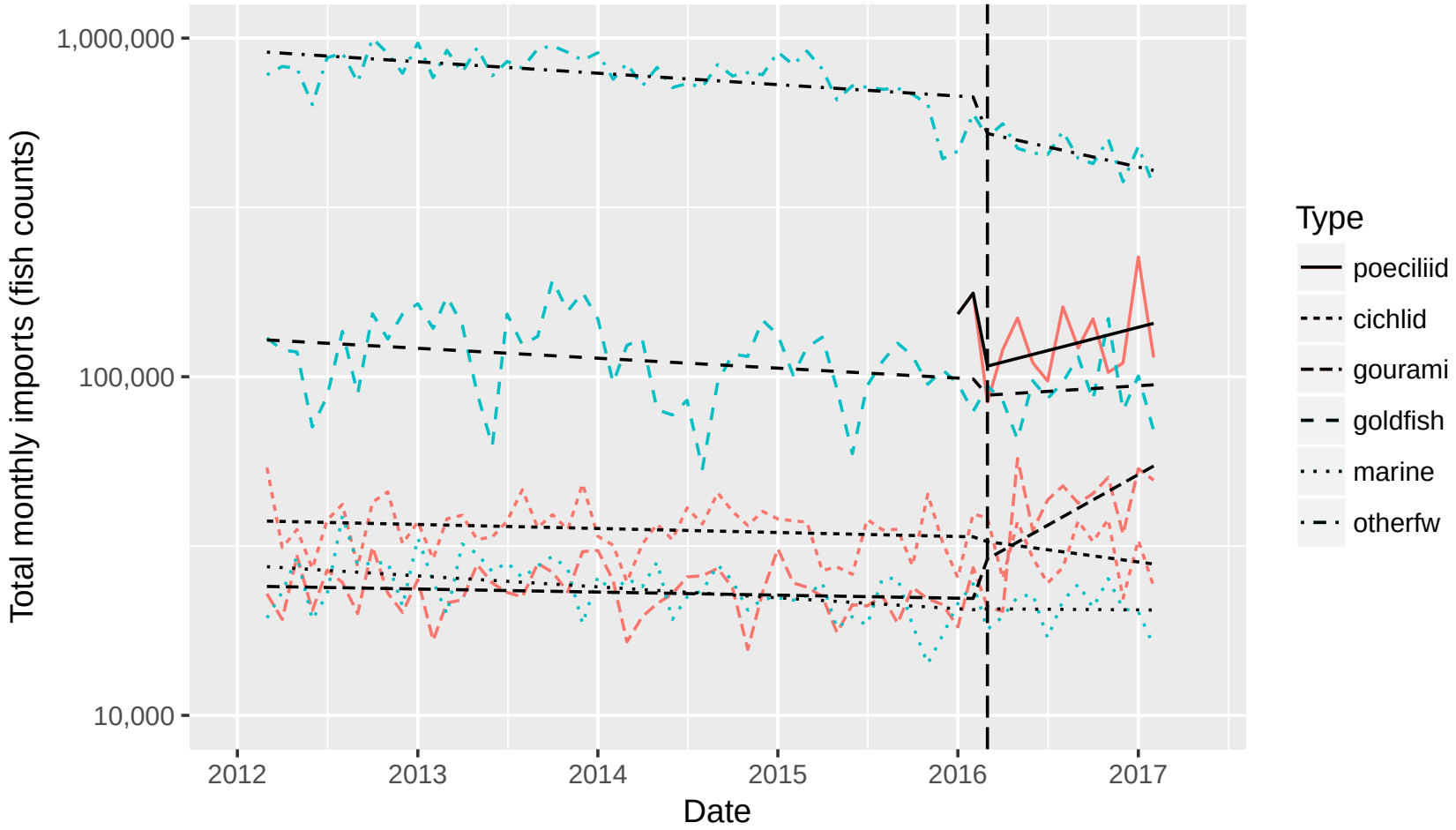
Detecting a mean change

Detecting a mean change

Type	mean change	95% CI	P-value
poeciliid	-22%	(-43%, 6%)	0.11
cichlid	-4%	(-16%, 11%)	0.6
gourami	+95%	(69%, 225%)	<0.001
goldfish	-8%	(-20%, 6%)	0.3
marine	-2%	(-15%, 13%)	0.8
otherfw	-33%	(-42%, -23%)	<0.001

What if the trend over time is different for different types and/or the policy change impacts the slope as well?

Detecting a change in slope



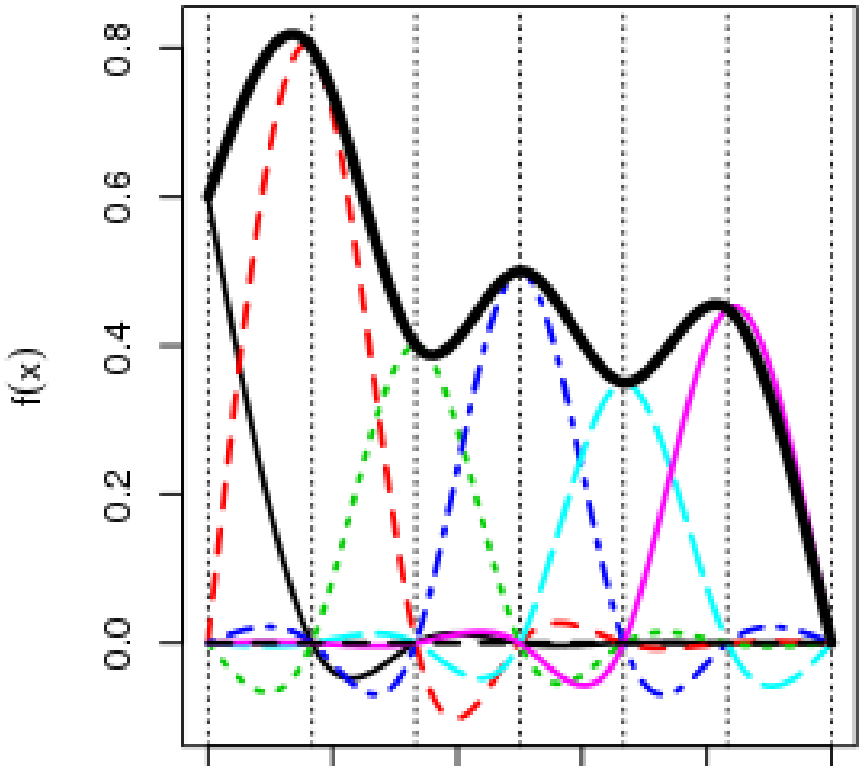
Detecting a change in slope

Detecting a change in slope

Type	slope change	95% CI	P-value
poeciliid	-11%	(-48%, 53%)	0.6
cichlid	-1%	(-4%, 2%)	0.5
gourami	6%	(3%, 9%)	<0.001
goldfish	1%	(-2%, 5%)	0.5
marine	0%	(-3%, 4%)	0.7
otherfw	-2%	(-5%, 2%)	0.3

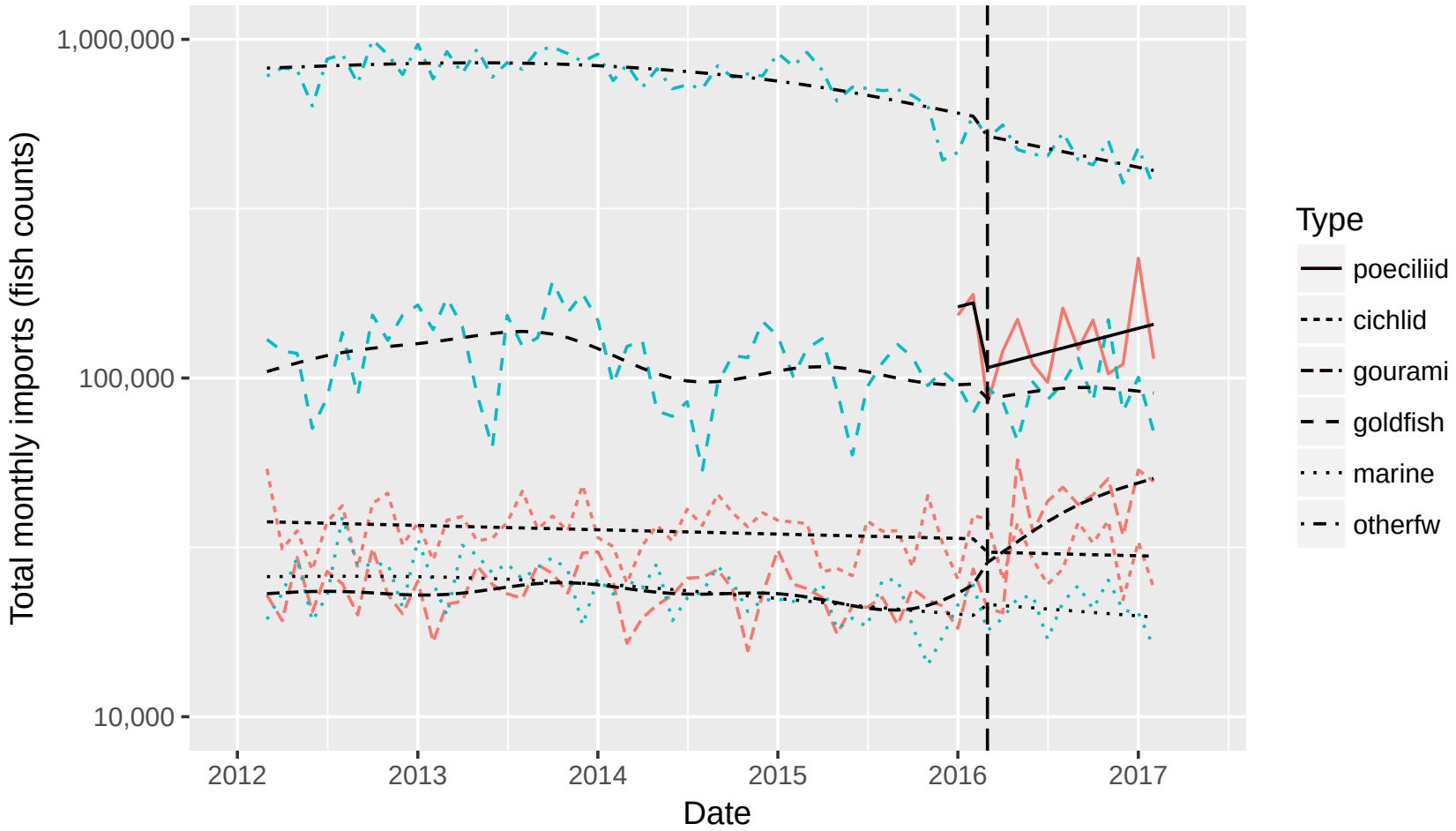
What if the underlying pattern over time was non-linear?

Generalised Additive Model (GAM)



- Enables a more flexible regression line

Generalised Additive Model



Generalised Additive Model

Type	mean change	95% CI	P-value
poeciliid	-37%	(-75%, 61%)	0.3
cichlid	9%	(-8%, 30%)	0.3
gourami	9%	(-24%, 57%)	0.6
goldfish	-10%	(-38%, 30%)	0.6
marine	9%	(-18%, 44%)	0.6
otherfw	-11%	(-33%, -19%)	0.4

Generalised Additive Model

Some comments about aggregation

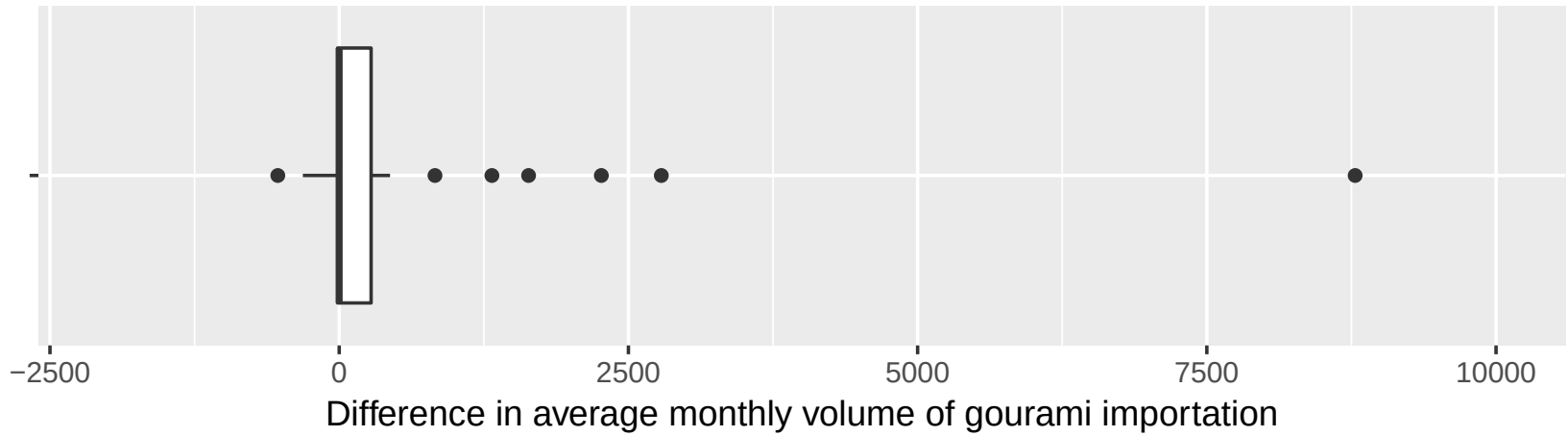
Our analysis was based on *monthly counts*, but other aggregation is possible.

Considerations:

- Units of observation and false replication
- Degrees of freedom
- Autocorrelation
- Interpretation

Some comments about importers and exporters

- Patterns of behaviour
- Individual importers and exporters



Thank you