Offline crime may go back to normal, cyber won’t: Interrupted time-series analysis during COVID-19

Ideas

Interrupted time series analysis + counterfactuals: https://ds4ps.org/pe4ps-textbook/docs/p-020-time-series.html#the-counterfactual

Focus in Northern Ireland

# Authors

# Corresponding author

# Acknowledgements

# Abstract

# Keywords

Coronavirus; Fraud; Counterfactuals; Temporal; Routine activities; Cyber-enabled

# Introduction

Intro to covid, social changes and crime/cyber

Describe lockdowns in NI

Aims of paper

Distribution of paper

# Rapid social changes and crime: The COVID-19 case

# The present study

# Methodology

## Data

Data recorded and published by the Police Service of Northern Ireland between April 2015 and May 2021 in the crime open data portal (<https://www.psni.police.uk/inside-psni/Statistics/police-recorded-crime-statistics/>). Historical crime data can also be downloaded from the online portal of Open Data Northern Ireland (<https://www.opendatani.gov.uk/dataset/police-recorded-crime-in-northern-ireland>).

## Analytical approach

Interrupted time series analysis and counterfactuals

represents time, and the first and second lockdowns, respectively, and and the time past since the first and second lockdowns, respectively.

Counterfactual predicted from

# Results

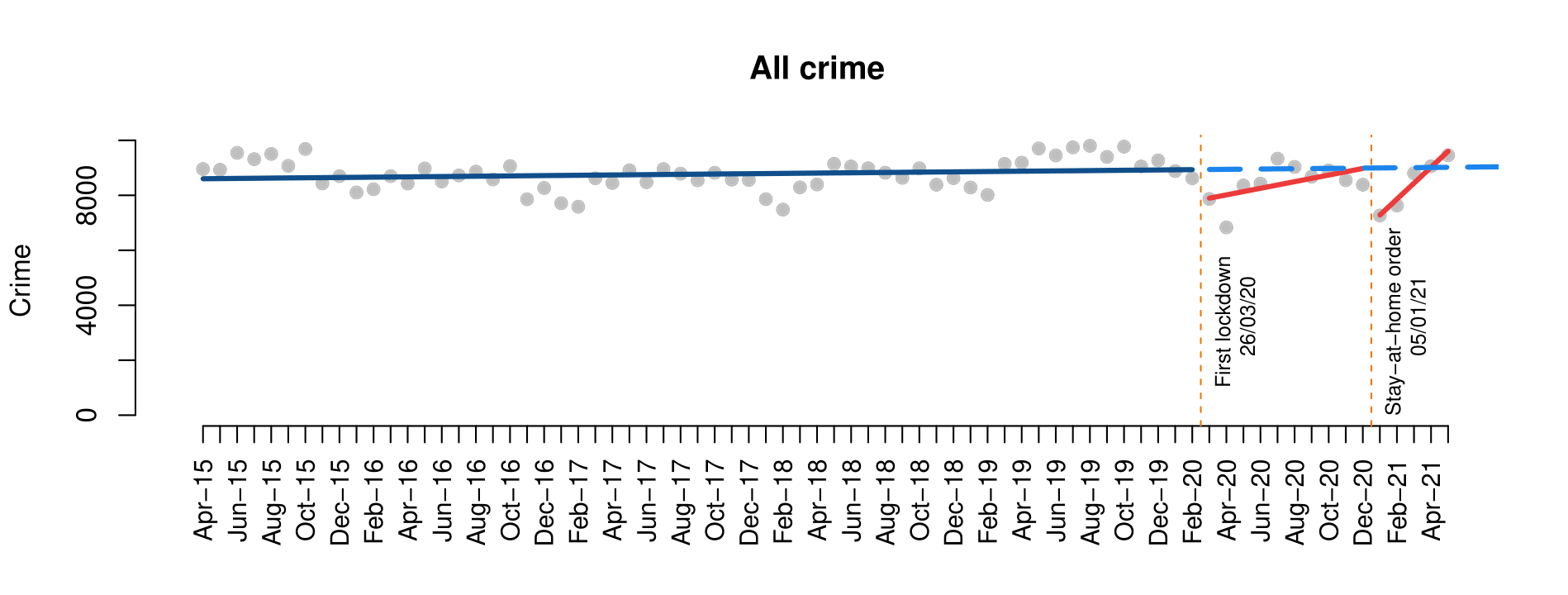


Figure X. Interrupted time series analysis of all crime

## Violent and sexual crime

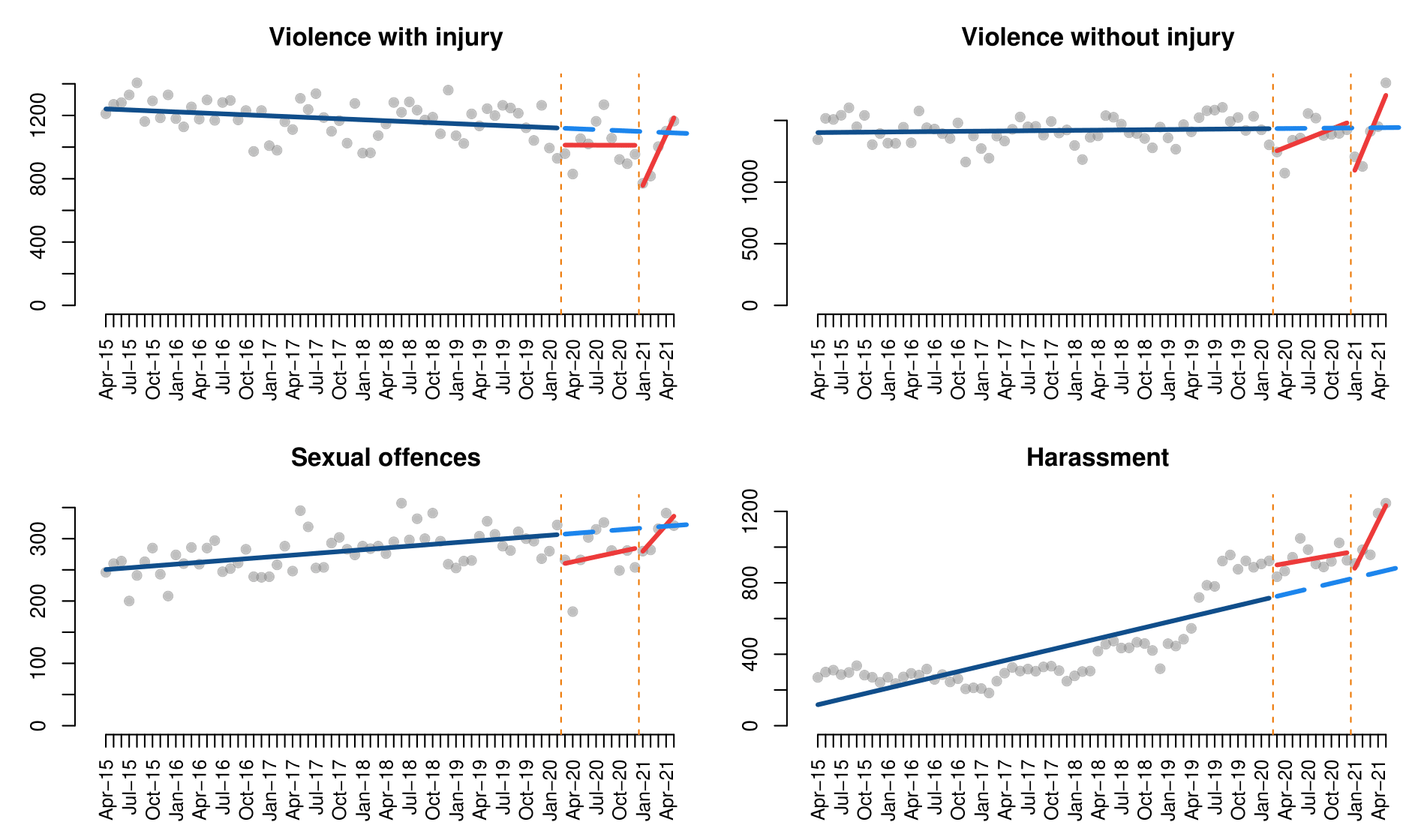


Figure X. Interrupted time series analysis of violent and sexual crimes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Violence with injury | Violence without injury | Sexual offences | Harassment |
| (Intercept) | 1243.3\*\*\* | 1401.2\*\*\* | 249.5\*\*\* | 107.0\*\* |
| Time | -2.1\* | 0.5 | 1.0\*\*\* | 10.3\*\*\* |
| First lockdown | -108.1 | -204.5\* | -48.8\* | 178.0+ |
| Time since first lockdown | 1.9 | 24.6\* | 1.7 | -2.7 |
| Second lockdown | -450.0\*\*\* | -496.3\*\*\* | -50.4 | -24.2 |
| Time since second lockdown | 109.1\*\* | 151.8\*\*\* | 13.1 | 77.7+ |
| Adjusted R2 | 0.37 | 0.22 | 0.24 | 0.82 |

\*\*\*p-value<0.001, \*\*p-value<0.01, \*p-value<0.05, +p-value<0.1

Table X. Interrupted time series model of violent and sexual crimes

## Drug crimes, damage and public order

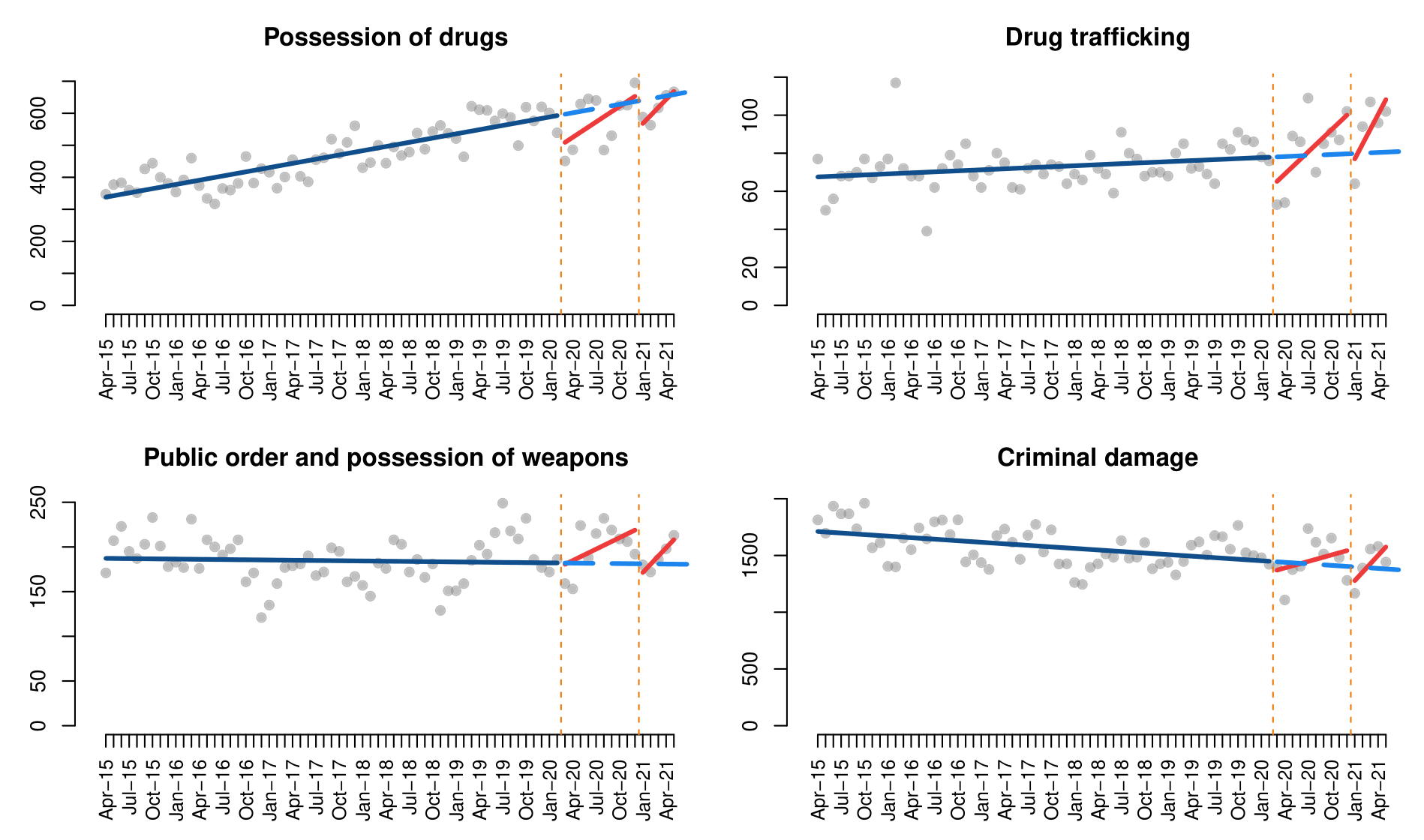


Figure X. Interrupted time series analysis of drug crimes, damage and public order

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Possession of drugs | Drug trafficking | Public order and possession of weapons | Criminal damage |
| (Intercept) | 333.8\*\*\* | 67.4\*\*\* | 187.3\*\*\* | 1716.0\*\*\* |
| Time | 4.4\*\*\* | 0.2\* | -0.1 | -4.5\*\*\* |
| First lockdown | -99.8\*\* | -16.6\* | -5.8 | -97.5 |
| Time since first lockdown | 11.6\* | 3.7\*\* | 4.3 | 23.6 |
| Second lockdown | -93.7+ | -10.5 | -19.0 | -200.1 |
| Time since second lockdown | 20.7 | 7.6\* | 9.3 | 78.8 |
| Adjusted R2 | 0.76 | 0.30 | 0.02 | 0.23 |

\*\*\*p-value<0.001, \*\*p-value<0.01, \*p-value<0.05, +p-value<0.1

Table X. Interrupted time series model of drug crimes, damage and public order

## Burglary

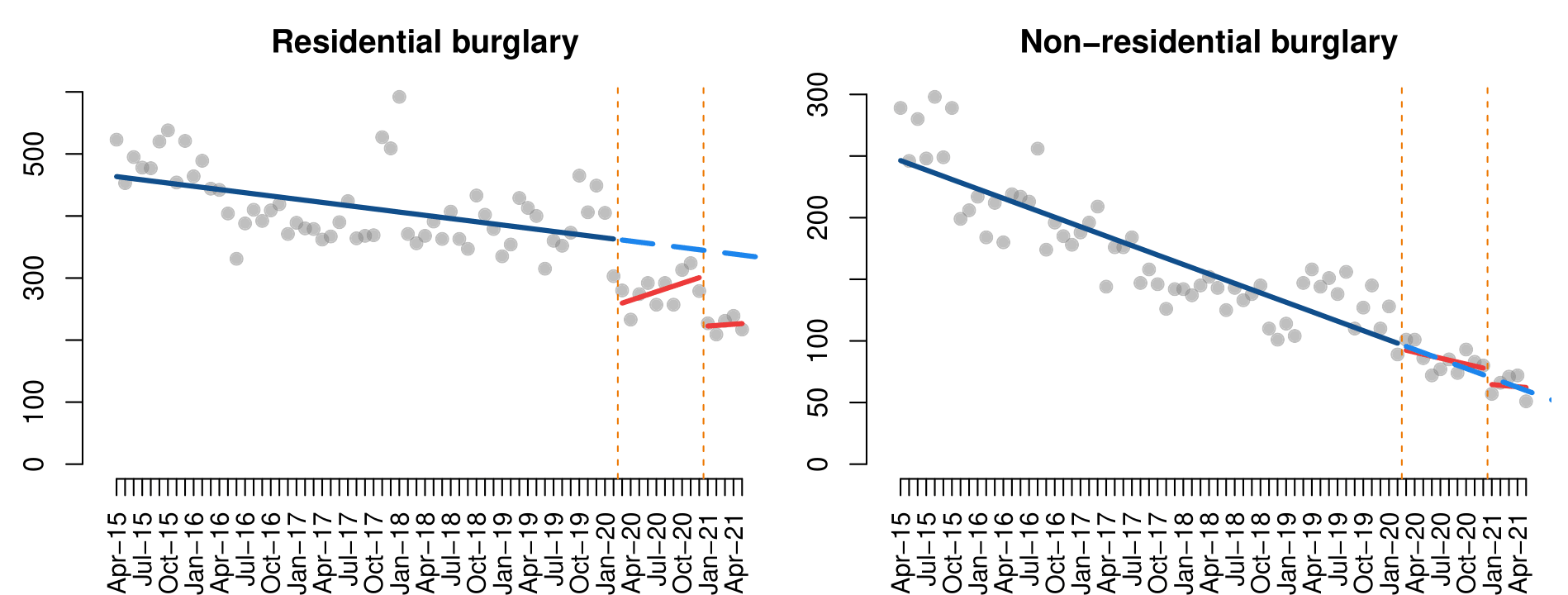


Figure X. Interrupted time series analysis of burglary

|  |  |  |
| --- | --- | --- |
|  | Residential burglary | Non-residential burglary |
| (Intercept) | 465.2\*\*\* | 248.9\*\*\* |
| Time | -1.7\*\*\* | -2.6\*\*\* |
| First lockdown | -108.0\*\* | -4.1 |
| Time since first lockdown | 6.3 | 0.9 |
| Second lockdown | -124.1\* | -7.4 |
| Time since second lockdown | 2.7 | 2.0 |
| Adjusted R2 | 0.63 | 0.83 |

\*\*\*p-value<0.001, \*\*p-value<0.01, \*p-value<0.05, +p-value<0.1

Table X. Interrupted time series model of burglary

## Theft and robbery

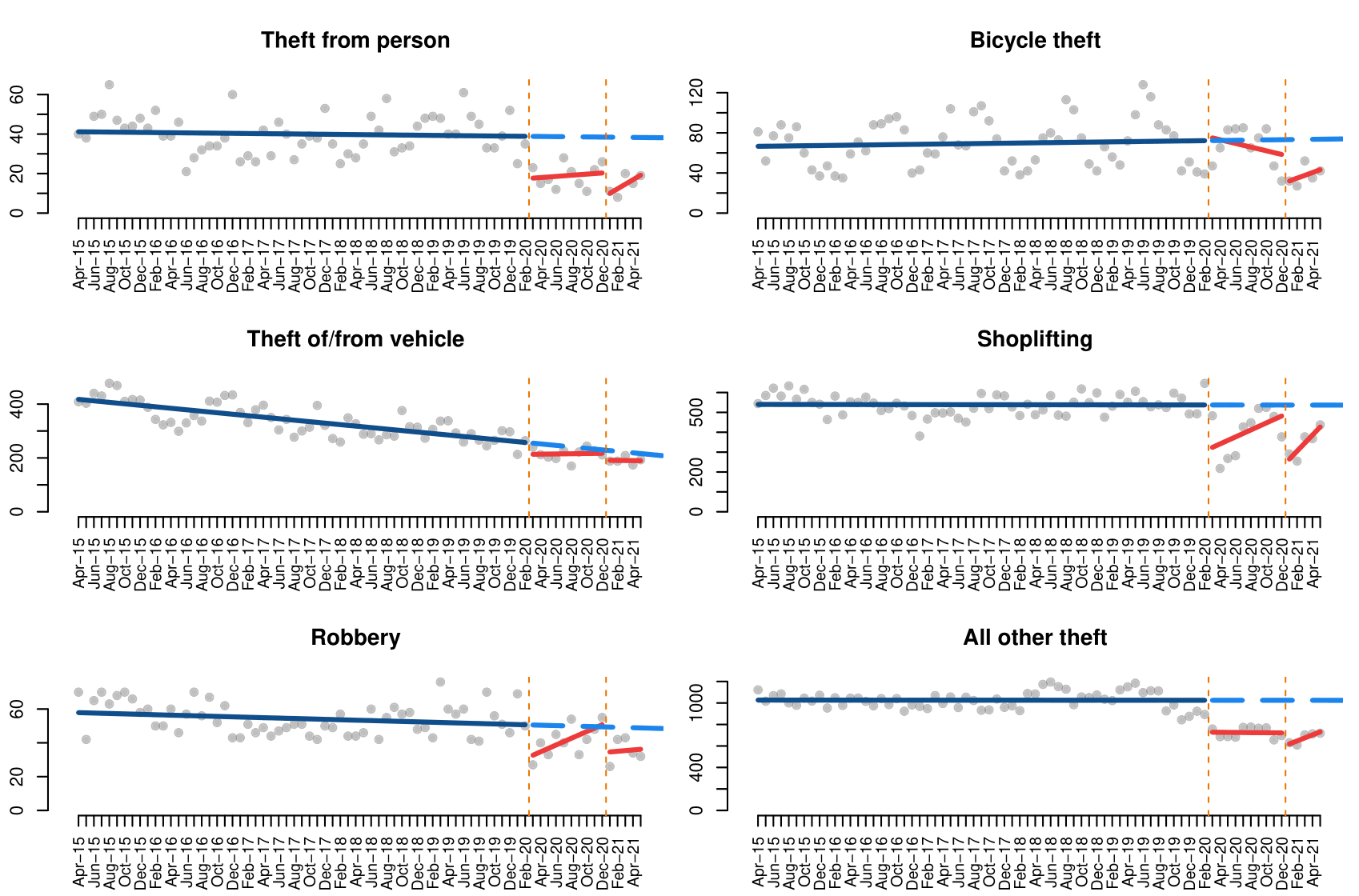


Figure X. Interrupted time series analysis of theft and robbery

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Theft from person | Bicycle theft | Theft of/from vehicle | Shoplifting | Robbery | All other theft |
| (Intercept) | 41.2\*\*\* | 66.5\*\*\* | 420.3\*\*\* | 540.0\*\*\* | 58.0\*\*\* | 1026.8\*\*\* |
| Time | -0.0 | 0.1 | -2.8\*\*\* | -0.0 | -0.1+ | -0.0 |
| First lockdown | -21.5\*\* | 4.6 | -44.4 | -231.1\*\*\* | -20.0\*\* | -297.0\*\*\* |
| Time since first lockdown | 0.3 | -1.9 | 3.2 | 17.6\*\* | 2.1\* | -0.6 |
| Second lockdown | -30.8\*\* | -44.0+ | -38.3 | -312.7\*\*\* | -15.3 | -434.7\*\*\* |
| Time since second lockdown | 2.3 | 2.7 | 2.4 | 40.5\* | 0.5 | 28.2 |
| Adjusted R2 | 0.47 | 0.06 | 0.76 | 0.54 | 0.33 | 0.74 |

\*\*\*p-value<0.001, \*\*p-value<0.01, \*p-value<0.05, +p-value<0.1

Table X. Interrupted time series model of theft and robbery

## Fraud and cybercrime

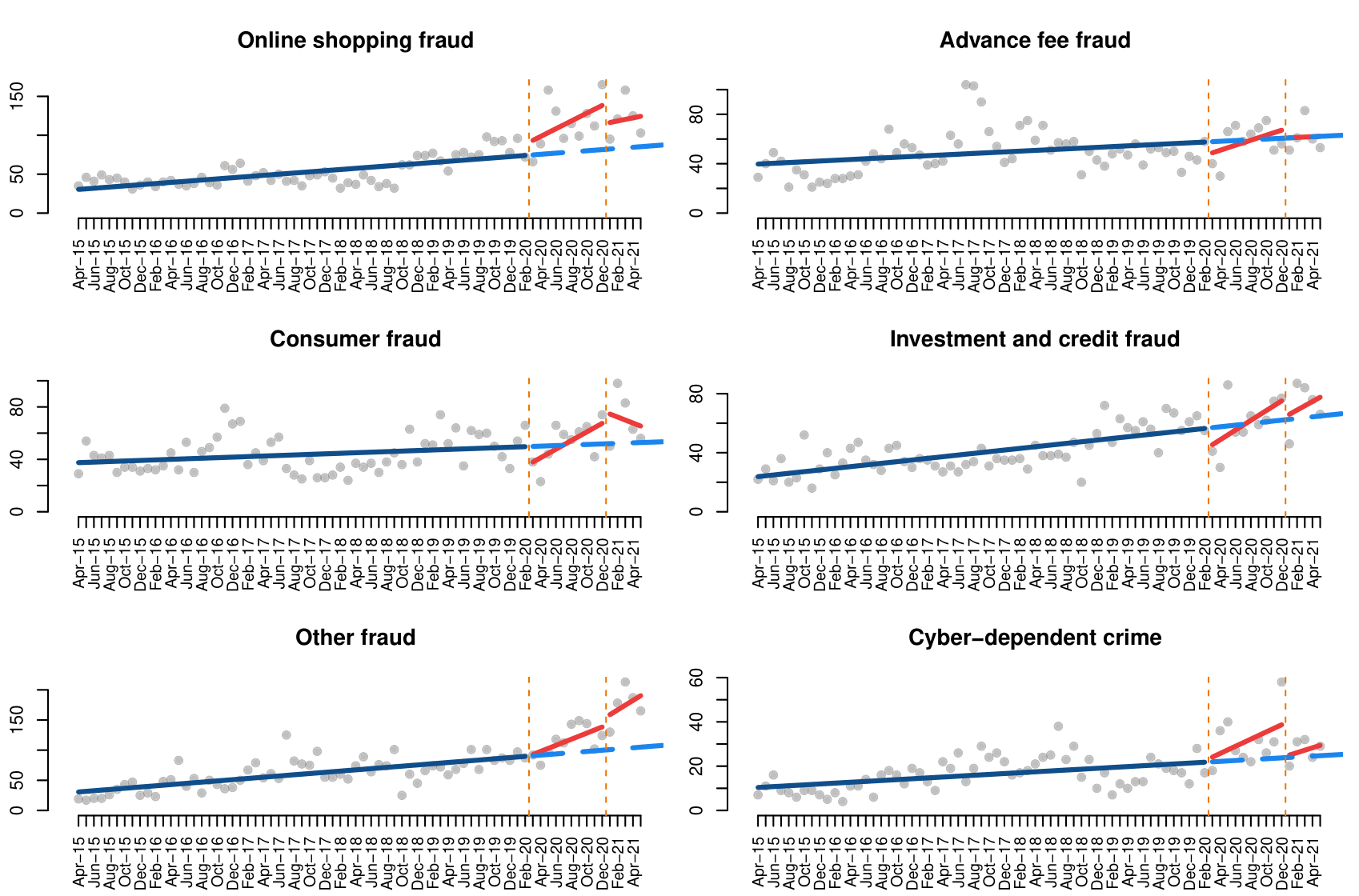


Figure X. Interrupted time series analysis of fraud and cybercrime

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Online shopping fraud | Advance fee fraud | Consumer fraud | Investment and credit fraud | Other fraud | Cyber-dependent crime |
| (Intercept) | 29.7\*\*\* | 39.4\*\*\* | 37.3\*\*\* | 23.2\*\*\* | 29.6\*\*\* | 10.2\*\*\* |
| Time | 0.8\*\*\* | 0.3\* | 0.2\* | 0.6\*\*\* | 1.0\*\*\* | 0.2\*\*\* |
| First lockdown | 14.4 | -10.7 | -15.1 | -14.3+ | -1.9 | 0.7 |
| Time since first lockdown | 4.2\* | 1.7 | 3.1\* | 2.7\* | 4.0+ | 1.4+ |
| Second lockdown | 32.8+ | 0.1 | 25.1 | 1.0 | 51.0\* | 0.2 |
| Time since second lockdown | 1.2 | -0.0 | -2.5 | 2.3 | 6.9 | 0.9 |
| Adjusted R2 | 0.76 | 0.09 | 0.24 | 0.60 | 0.78 | 0.45 |

\*\*\*p-value<0.001, \*\*p-value<0.01, \*p-value<0.05, +p-value<0.1

Table X. Interrupted time series model of fraud and cybercrime

# References