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School activity and spread of Covid-19 in Sweden

A timeseries analysis

The following hypothesis is tested:

H1: There is a chain of effects in the spread of Covid-19 in Sweden: increased activity in schools during the autumn of 2020 -> increased number of confirmed cases -> increased number of patients admitted to intensive care units -> increased number of deaths.

H0: the above power chain does not exist in Sweden.

# Data

Open data from the Swedish Public Health Agency (https://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/statistik-och-analyser/bekraftade-fall-i-sverige/) and movement data from Google (https : //www.google.com/covid19/mobility) has been used.

# Method

To clarify the causal relationship, a time series analysis has been carried out where the purpose is to investigate whether increased activity in the school sends impulses in a power chain with the following links: increased activity in the school -> increased spread of infection -> increased number of inpatients -> increased number of deaths. An econometric method called Vector Auto Regression (VAR) has been performed using the Eviews 12 statistics package.

A description of VAR can be found in the link below:

https://en.wikipedia.org/wiki/Vector\_autoregression#:~:text=Vector%20autoregression%20%28%20VAR%29%20is%20a%20statistical%20model,autoregressive%20model%20by%20allowing%20for%20multivariate % 20time% 20series.

The analysis covers the whole of Sweden between 11/3/2020 and 11/26/2020.

# Results

It is common to present results of VAR analyzes in impulse-response functions. These describe the effect on variable y of a standard deviation increase of variable X.

Figure 1 describes the effect on the number of cases (in Swedish “Totalt antal fall”) found per 100,000 inhabitants of one standard deviation's exogenous shock in increased activity in the school. Activity in school is measured with an index that varies between -3.5 and 5.0. Low values apply during school holidays and increase as the schools' teaching starts. All school levels from primary school to university are included in a school index.

The vertical axis of the figure shows the effect on the number of cases found per 100,000 inhabitants and the horizontal axis shows the number of days from the initial exogenous shock in the school index. The black line shows the estimated effect and the red lines show a 90% confidence interval. After ten days, the effect on the number of cases is estimated at 50 people per 100,000 inhabitants.

FIGURE 1



Figure 2 shows the next link in the power chain (number of cases -> the number of intensive care units per 100,000 inhabitants). This effect is also positive and statistically significant with a 95% confidence interval. The effect after 10 days is just over 0.6 hospitalized per 100,000 inhabitants.

FIGURE 2



The last link in the power chain is also significant with a 95% confidence interval. After 10 days, the effect on the number of deaths (in Swedish “Avlidna”) per 100,000 inhabitants of an increase in one standard deviation of the number admitted to intensive care units is 1.75 (figure 3).

FIGURE 3



The analysis shows that the hypothesis about the existence of the power chain exists in Sweden and the power chain is statistically significant with confidence intervals of between 90 percent and 95 percent.

In Sweden, there is doubt about the effect on the number of cases of school activities. This analysis provides support for the existence of a significant chain of effects that begins with increased activity in the school in the autumn. One sixth of the number of cases in Sweden between September and December 2020 can be explained by the fact that schools and universities started during the autumn.

In an ongoing research project, I investigate the role of the weather in the spread of infection.