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This is a presentation about my USS project over the last couple of months, governments have forced us to stay home to combat the COVID-19 pandemic. However, does staying home slow down COVID-19 transmission? This is what I looked at in my USS project. SARS-CoV-2019 has caused the global economy over $10 trillion dollars in forgone GDP in the financial year 2020-21. A central mechanism that governments have utilised to slow the spread of the disease are mobility restrictions, popularly called lockdown. This mechanism will stay important until the vaccine rollout has succeeded. Yep, there's little consensus about the exact causal effect of mobility restrictions on Covid 19 cases. So what I do, my research attempts to uncover the causal relationship between people's mobility pattern and COVID-19 cases, and the growth rate of COVID-19 cases using latest econometric techniques. In particular, I investigate how increases of time spent at home affect COVID-19 growth rates on a country level.

I draw upon data from 47 countries across the world in different stages of the pandemic as of August 2020, which have reliable data on. Mobility patterns in COVID-19 cases and I categorise the countries into countries that successfully overcame the first wave and do not experience a second wave as of August 2020. Those that are in the second wave as of 2020 August 2020 and those are in the 1st place wave as of 2020 August 2020. My research refines estimates of previous research, such as Border 2020, Orville Mike de 2020, by utilising more rigorous econometric methods which are uncommon for studies outside the field of economics, and thereby, while imperfect, the study comes closer at estimating the causal effect of increased time spent at home on the growth rate of COVID-19. So let's have a look at my data. First thing on the COVID-19 data, which is the seven day cumulative number of COVID-19 cases per million collected by the European Center of Disease Prevention and Control and provided by ourworldindata.org.

And here you see my three categories and that as I described, first wave countries are in their first wave, while successful countries have successfully combated the first wave and second wave countries are currently in their second wave. I also used mobility data provided by Google and what you see here is mobility data for time spent at home or time spent in residential areas. And what Google does is it indexes on the mobility or time spent at home in February 2020 and then compares by how many percentage points time spent at home was at different points of time, and so you can see on average it seems like compared to 2020 to February 2020, people spent around 30 percentage points more time at home at the beginning of the pandemic.

I've said that other factors besides staying home may affect the transmission of COVID-19. And this is the main issue of why we cannot estimate the causal effect of staying at home on COVID-19 transmission. So what I do is I use a so-called within group estimation, which cancels out time invariant factors on a country level. Besides staying home that affect the number of COVID-19 cases. So that is, for example, warmer climate, population density, or the effect of culture or effect of people's hygiene. And I estimates the following regression equation. We're on the left side or the dependent variable. I've got the log difference of seven day committed number of COVID-19 cases per million in country I date t, which is basically the growth rate of covid daily growth rate of COVID-19 in a given country. And then I've got Alpha I, which is a country, fixed effects and captures the country specific factors effect on the growth rate of COVID-19, and then I have three types of will ability measures.

That is, the mobility or time spend in residential areas or at home. The time spent in grocery stores and the time spent in parks. And then I have an idiosyncratic error term. So what this regression does? And so what beta one estimates is the unique effect that staying at home has on the growth rate of COVID-19 cases accounting for country specific factors that affect the growth rate and

accounting for the level of mobility in grocery stores in parks. So this comes pretty close to plausible causal estimate of staying at home on the growth rate of COVID-19, but obviously some other factors might be there as well that affect us, so I don't want to say it's a completely causal effect. And the regression results are shown here in a graphical way. What you can see if you look at the blue line, is that if you move from an mobility level of in residential areas from zero to 20, this would reduce the growth rate of COVID-19 by nearly 20%. In other words, a 10% increase in erm 10 percentage point increase of ability in residential areas lead to a 5.88% decrease in the growth rate of COVID-19 cases and the red line is just a non-linear version of the regression estimation I done.

I presented before and what it basically does is it confirms the estimates of the blue line which is the linear version. Finally, I also re estimated the equation I presented before separately for each country and plotted these results against GDP per capita of a country, and this figure shows very nicely the presented changing the growth rate of COVID-19 cases for 10% point increase in the mobility at home or time spent at home against countries wealthier countries in terms of income, have a higher effect of staying at home on the reduction of the growth rate of COVID-19 cases with other words.

Wealthy countries are more successful in reducing the growth rate of COVID-19. By increasing the time spent at home. There are some limitations of my paper. There are lots of outliers which I count for my robustness check and show that they don't affect the estimates. Another major problem is that within group estimators cannot control for time varying factors that affect the transmission of COVID-19, and this is why I included mobility in parks and mobility in grocery stores to account for this, but there might be other things that might be confounding my results, such as the pattern of how people wear their masks or the international travel patterns and other things that might be time varying. In effect, the growth rate of COVID-19 and therefore my results might be biased. And finally I look at country level which absorbs heterogeneity within the countries, especially large countries like the USA. So future research could look at more fine grained data to account for this. And that is it. Thank you for listening.