Are quarantine restrictions effective at reducing the growth rate of COVID-19 in Central Asia?

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Abstract

In regards to COVID-19, this research uses Kazakhstan and Kyrgyzstan as a case study to argue that quarantine restrictions influence the growth rate of new cases and not the levels of new cases. The data shows that as quarantine restrictions are imposed the growth rate is gradually reduced, and when restrictions are removed the growth rate is gradually increased. Based on this, it is argued that the effectiveness of restrictions can be measured as the amount of reduction in the growth rate of new cases during a time of restriction. In the summer of 2020, Kazakhstan had a full lockdown with many business closures, while Kyrgyzstan had a partial lockdown that allowed many businesses to remain open with curfews. Interesting enough, the growth rate for both countries became negative and dropped roughly the same amount of 12 percentage points. Therefore, to limit the spread of the virus, this paper argues that countries should impose a partial lockdown as it is just effective as a full lockdown at reducing the growth rate of new cases.

Are quarantine restrictions effective? This is a question that everyone wonders about. Intuitively perhaps quarantine restrictions should decrease the number of new COVID-19 cases. Let's see if this is the case. Kazakhstan and Kyrgyzstan will be used in a case study as both countries are similar and have very similar trends in the number of new cases and quarantine dates. Figure 1 shows the number of new cases for Kazakhstan (in red) and Kyrgyzstan (in black) along with a trend line. Quarantine restrictions are given as the vertical lines for both countries.

In 2020, there were three periods of quarantine restrictions. In the spring, starting in March both countries had full lockdowns until mid May. This was a period of heavy business closures that only allowed essential businesses like grocery stores and pharmacies to remain open. This period is not shown in the figure as there were many missing observations and the number cases remained relatively low and highly volatile. Then in the summer Kazakhstan had a second full lockdown from July 5th until August 16th while Kyrgyzstan had a partial lockdown from July 1st until August 15th. The partial lockdown allowed many businesses to remain open with curfews including restaurants and shopping centers; there were continued closures however on schools, fitness clubs, cinemas, bars, karaoke, and nightclubs; perhaps these are locations with too much social interaction.

Although both countries imposed the restrictions in early July the number of new cases did not start decreasing until after July 20th. The cases then kept decreasing and quarantines were removed mid August; even so the cases continued to decrease until mid September. Kyrgyzstan then imposed localized fall restrictions September 28th, but its cases continued to increase until the beginning of November. Similarly, Kazakhstan also imposed localized restrictions October 24th, but its cases never decreased afterwards. Given this data it is hard to argue that quarantine restrictions limit the number of new cases.[1]

Interesting enough one could argue that quarantine restrictions reduce the growth rate in new cases rather than their levels.[2] One could compute the daily growth rate directly from the new cases data, but it is much too volatile; therefore, a two week moving average of it is computed as a smoother. The results are shown in figure 2 alongside a trend. In this figure the growth rate is given as a decimal point where a .05 represents a 5% increase in daily new cases, while a -.05 represents a 5% decrease.

At a first glance it appears that this growth rate is much more correlated with the quarantine restrictions. As shown in the figure, starting in May the growth rate increases until it reaches a peak around the end of June. This is perhaps due to increased public caution and lack of testing kits just prior to the summer quarantine in early July.[3] As the summer quarantine is imposed the growth rate continues to decline and reaches a negative territory at the end of July; this is where the levels of new cases actually start decreasing. The growth decline lasts until the end of the quarantine period in mid August. With the removal of restrictions, the growth rate then gradually starts increasing (but remains in a negative territory). Eventually it turns positive and Kyrgyzstan imposes fall restrictions at the end of

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[1] Data on new COVID-19 cases is taken from https://www.worldometers.info and is based on official government sources. Data on quarantine restrictions in from Russian news articles and official announcements found here: Azattyk (2020), Chief Sanitary Doctor (2020), Meria (2020), Republican Headquarters (2020), Tokayev (2020a), Tokayev (2020b), and Zhuravleva (2020).

[2] The growth rate is the ratio of new cases today divided by the previous day's new cases minus one. If new cases go from 1000 to 1100 from one day to the next then the growth rate is 0.1 or 10% growth.

[3] See Sputnik (2020) and Vlast (2020).

September. Soon after the growth rate for Kyrgyzstan again starts declining. Eventually it turns negative in the beginning of November and so new cases begin to decline as well. In the meantime, Kazakhstan also imposes fall restrictions at the end of October and its growth rate does start to decline but never reaches a negative territory until the end of the sample. Based on this evidence it appears that the quarantine restrictions are indeed very important as they are able to influence the growth rate of the virus.

Notice that the most effective restrictions were the summer lockdowns for both countries. The growth rate in Kazakhstan dropped roughly from .04 (or 4% increase in new cases per day) in the beginning of July to -.08 (or an 8% decrease in new cases per day) in the middle of August. This is a 12 percentage point drop. On the other hand for Kyrgyzstan the growth rate dropped from .06 in the beginning of July to -.06 in the middle of August. This is again a 12 percentage point drop. Interesting enough, although it appears that the summer lockdowns were just as effective for both countries, Kazakhstan had a very strict lockdown with many business closures while Kyrgyzstan only had a partial lockdown. As of May 2021 both countries, and many other countries around the world, have seen an explosion in new cases. As the evidence from Central Asia shows, to avoid drastic economic consequences, countries can obtain similar results by implementing a partial lockdown instead of a full lockdown

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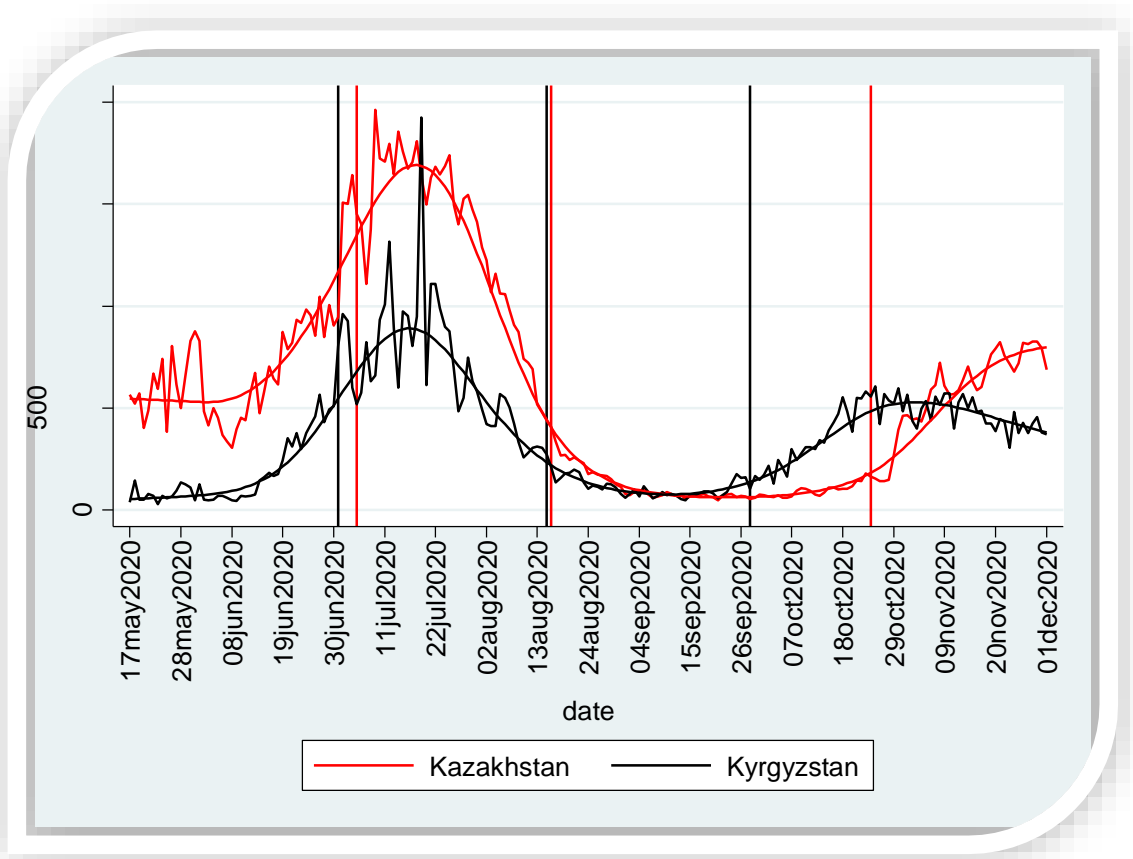
Figure 1: New cases

Figure 2: Growth rate in new cases