Baseline Specification for the Kraj Panel Analysis

We downloaded the daily Kraj-level data for cases and the cumulative number of individuals in quarantine from the following two sources: (1) https://onemocneni-aktualne.mzcr.cz/api/v2/covid-19 for cases, and (2) https://www.cssz.cz/nemocenska-statistika#section_5 for quarantines. Next, we converted each of cumulative quarantines to the daily *net* inflows into quarantine by simply differencing the data. This preparation leaves us with a *panel* of Kraj's indexed by *i*, observed for the whole pandemic period, daily with days indexed by *t*. We denote net daily quarantine inflows in given kraj at a given day by $DailyQuarantineInflow_{it}$, and the number of daily cases in given kraj at a given day by $DailyCases_{it}$.

$$DailyQuarantineInflow_{it} = \mu_i + \lambda_t + \sum_{\tau=0}^{5} \beta_\tau L^\tau(DailyCases_{it}) + \sum_{\tau=1}^{5} \gamma_\tau L^\tau(DailyQuarantineInflow_{it}) + \epsilon_{it},$$

where $L^\tau(\cdot)$ is the lag operator—we get lags once we apply it to a variable.

In words, we regress net daily quarantine inflows on the contemporaneous daily cases and on up to five lags of cases, controlling for (1) net daily quarantine inflows in the last five days via five lags of the dependent variable in the left-hand side; (2) day- and Kraj-fixed effects. The latter eliminates all of the unobserved heterogeneity of Kraj's that is constant over time and all of the unobserved heterogeneity that describes the evolution of the quarantine inflows for the country as a whole.

The coefficients of interest are $(\beta_1, \beta_2, \beta_3, \beta_4, \beta_5)$—the lagged responses to daily cases. The sum of these coefficients gives an estimate of how many individuals are put into quarantine in the next five days after detecting a new case.

We report the results for two time periods: the main period of estimation is the 29th of May to the 30th of June, the restricted period is the 29th of May to the 25th of June. Column (1) of Table 1 shows the results for the main period, and column (2) of Table 1 turns to the restricted period. Overall, we see that almost all of the estimates are lower in column (2) compared to column (1), and some estimates in column (2) are not significant at 5% level.

Table 1: Baseline Specification and Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)
	The dependent variable is: $DailyQuarantineInflow_{it}$					
$DailyCases_{it}$ (DC_{it})	0.502***	0.418***	0.502**	0.418**	0.585***	0.522***
	(0.125)	(0.111)	(0.134)	(0.114)	(0.117)	(0.112)
$L^1(DC_{it})$	0.485**	0.248*	0.485*	0.248	0.459**	0.239
	(0.161)	(0.122)	(0.169)	(0.183)	(0.153)	(0.125)
$L^2(DC_{it})$	0.623***	0.232	0.623**	0.232	0.631***	0.256*
	(0.163)	(0.124)	(0.169)	(0.165)	(0.154)	(0.126)
$L^3(DC_{it})$	0.404*	0.476***	0.404	0.476**	0.383*	0.497***
	(0.169)	(0.128)	(0.191)	(0.141)	(0.160)	(0.130)

$L^4(DC_{it})$	0.469^{**}	0.354^{**}	0.469	0.354	0.447^{**}	0.358^{**}
	(0.171)	(0.133)	(0.262)	(0.173)	(0.161)	(0.135)
$L^5(DC_{it})$	0.393^{*}	-0.106	0.393	-0.106	0.452^{**}	-0.058
	(0.169)	(0.131)	(0.230)	(0.144)	(0.158)	(0.133)
$N \cdot T$	416	364	416	364	416	364

Standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Robustness Remark for Table 1

We probe the robustness of our results to two concerns that can arise in this setting. A minor one is that the error term can be correlated within Kraj's over time and within the same day in different Kraj's. We use two-way cluster robust standard errors, as suggested by Cameron, Gelbach, and Miller (2012). Columns (3) and (4) show the results for this method. If anything, some of the lagged coefficients become even less significant, corresponding to a more noisily estimated response of the health authorities.

A more critical issue can arise due to the inclusion of the lags of the dependent variable on the left-hand side, i.e., among the explanatory variables. It is a problem known as Nickell (1981) bias, and Arellano and Bond (1991) suggested a method of moments estimator to mitigate it. We use their approach and columns (5) and (6), and the results are qualitatively the same to the baseline (1) and (2).

Case Study: Praha vs. Moravskoslezský kraj

To dig deeper into the data, we look at two separate time series: one for Prague and one Moravskoslezský Kraj. We estimate a more parsimonious specification, again for the main and the restricted period:

$$\begin{aligned} DailyQuarantineInflow_t \\ &= \alpha + \beta_0 DailyCases_t + \beta_1 L^1(DailyCases_t) + \gamma_1 L^1(DailyQuarantineInflow_t) \\ &+ weekend_t + \epsilon_t, \end{aligned}$$

Note that we only include one lag of outcomes and the explanatory variable, but we control for the weekend dummy in this specification.

Table 2: Case Study: Prague vs. Moravskoslezský kraj

	(1)	(2)	(3)	(4)
	The dependent variable is: $DailyQuarantineInflow_{it}$			
$DailyCases_{it}$ (DC_{it})	0.291	0.856	-0.027	0.019
	(0.332)	(0.604)	(0.514)	(0.404)
$L^1(DC_{it})$	0.147	0.746	0.756^{*}	0.658^{*}
	(0.252)	(0.546)	(0.441)	(0.371)
N	28	32	28	32

Standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

References

Arellano, Manuel, and Stephen Bond. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *The review of economic studies* 58.2 (1991): 277-297.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. "Robust inference with multiway clustering." *Journal of Business & Economic Statistics* (2012).

Nickell, Stephen. "Biases in dynamic models with fixed effects." *Econometrica: Journal of the econometric society* (1981): 1417-1426.

Wooldridge, Jeffrey M. *Econometric analysis of cross section and panel data*. MIT press, 2010.