Questioning the spatial association between the spread of COVID-19 and transit usage in Italy

Mattia Borsati [1] Silvio Nocera [2] Marco Percoco [1]

[1]Bocconi University

[2]IUAV University of Venice

Joint Online Workshop of WCTR SIG F1 and AUM

February 25, 2021

Overview

Research question

- To curb the spread of COVID-19, several governments imposed (among many other policies) restrictions on public transport.
- How dangerous is it to move around a certain territory? Does the danger depend on the mode of transport?
- We test whether places in which commuters were more prone to use public transport were more severely affected by the first wave of the pandemic in Italy.

Timeline

Measuring the spread of COVID-19 and transit usage[1]

$$mortality\_growth_{it} = \frac{fatalities_{it}^{total(20)} - fatalities_{it}^{mean(15-19)}}{fatalities_{it}^{mean(15-19)}} \quad (1)$$

- i denotes the LLM and t denotes the day. Trend

- $transit_i$ = share of the population who commute by collective means of transport for work or study reasons.

Maps

[1] *Source*: ISTAT and 2011 national census.

Measuring commuting and other factors[2]

$$internal\_commuting_i = \frac{p_{ii}}{population_i} \quad (2)$$

- p_{ii} measures the self-flows.

$$external\_commuting_i = \frac{\sum_{j=1}^{n}(p_{ij} + p_{ji})}{population_i} \quad (3)$$

- p_{ij} measures the out-flows.
- p_{ji} measures the in-flows.

- Control variables = $altitude$, $coastal$, $ln\_density$, $house\_m^2\_pc$, $share\_over75$, $hospital\_beds$, $pm10$, $district$.

[2] *Source*: ISTAT and 2011 national census.

Econometric model

$$
\begin{aligned}
mortality\_growth_{it} = \beta_0 &+ \beta_m transit_i \times \delta_m \\
&+ \gamma_m internal\_commuting_i \times \delta_m \\
&+ \eta_m external\_commuting_i \times \delta_m \\
&+ \omega_m Z_i \times \delta_m + \alpha_i + \delta_t + \epsilon_{it}
\end{aligned}
\tag{4}
$$

- All explanatory variables are interacted with month dummies δ_m.
- α_i and δ_t are LMM and day fixed effects.
- ϵ_{it} are standard errors clustered at the LLM level.

Table 1: Transit usage, commuting, and mortality growth ▸ Coefplot ▸ Quantiles

	mortality_growth			
	(1)	(2)	(3)	(4)
transit × *March*	-0.945	-1.070	-1.273	-0.976
	(0.907)	(0.830)	(0.970)	(0.930)
transit × *April*	-0.336	-0.537	-0.158	-0.079
	(0.699)	(0.637)	(0.663)	(0.681)
internal_commuting × *March*		3.600***	2.183***	1.126*
		(0.662)	(0.618)	(0.611)
internal_commuting × *April*		2.871***	2.236***	1.815***
		(0.433)	(0.527)	(0.496)
external_commuting × *March*		4.468***	3.821***	2.261***
		(0.824)	(0.845)	(0.607)
external_commuting × *April*		2.652***	2.280***	1.627***
		(0.433)	(0.481)	(0.443)
LLM FE	✓	✓	✓	✓
Day FE	✓	✓	✓	✓
Geographic controls × δ_m	✗	✗	✓	✓
Demographic controls × δ_m	✗	✗	✓	✓
Vulnerability controls × δ_m	✗	✗	✗	✓
Economic controls × δ_m	✗	✗	✗	✓
Observations	105 948	105 948	105 948	105 948
R^2	0.06	0.07	0.07	0.08

OLS estimates. ***p<0.01, **p<0.05, *p<0.1.

Concluding remarks

- The statistically weak association between COVID-19-related fatalities and transit usage suggests that:
    - Locations where transit was most used were not severely affected by higher excess mortality[3].
    - What matters most is whether people move[4], not how they move.

- Clearly, we cannot rule out the possibility of virus transmission on public transport.

[3] Askitas et al. (2021), Wielechowski et al. (2020).

[4] Cintia et al. (2020), Iacus et al. (2020), Borsati et al. (2020).

Thank you for your attention!

mattia.borsati@unibocconi.it

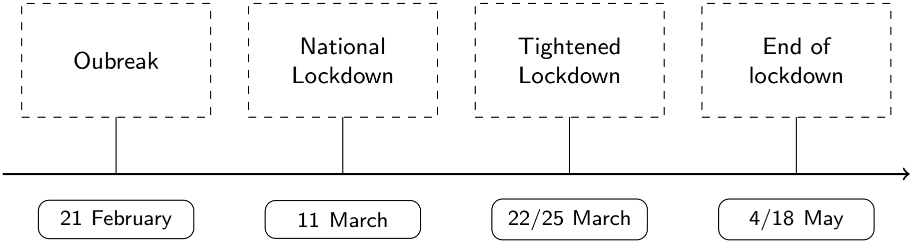
nocera@iuav.it

marco.percoco@unibocconi.it

Back to Top

The COVID-19 crisis ▸ Back

Figure 1: Timeline of the main events



- Italy was the first Western country to be deeply affected by the disease.

Figure 2: Evolution of *mortality_growth* in Italy, by day ▸ Back

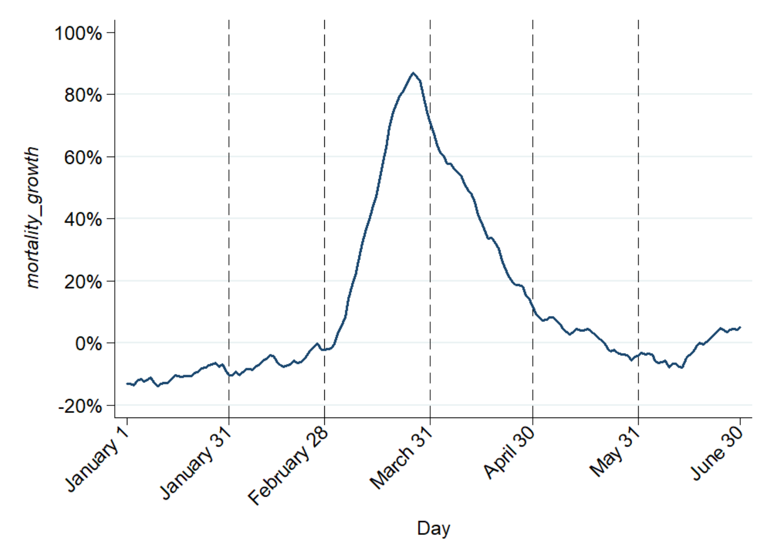
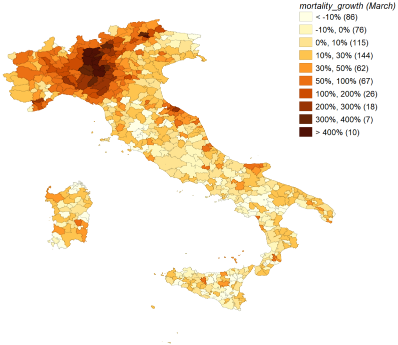


Figure 3: Descriptive evidence, by LLM ▸ Back

(a) Average *mortality_growth* in March



(b) *transit*

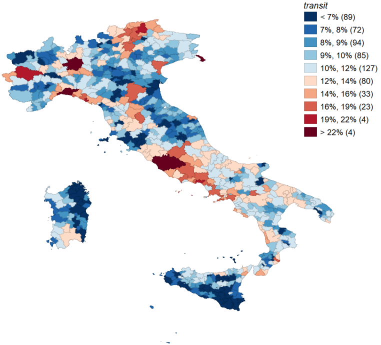
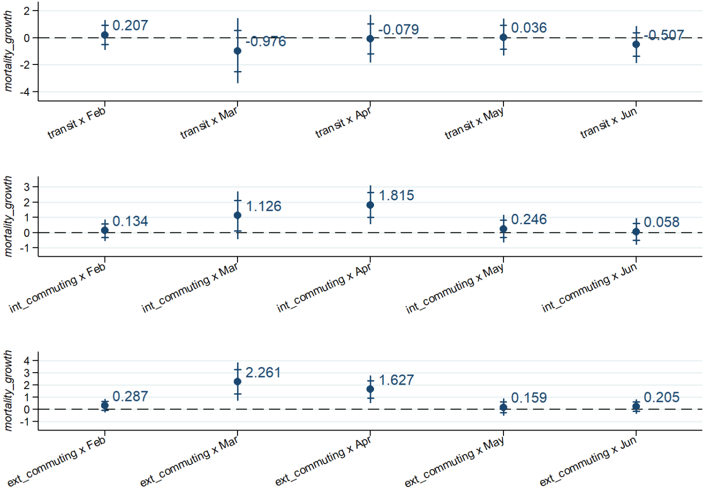


Figure 5: Estimated coefficients[5] of transit and commuting indices ▸ Back



[5] With 99% and 90% confidence intervals.

Figure 6: Quantile regression coefficients (*transit* in March) ▸ Back

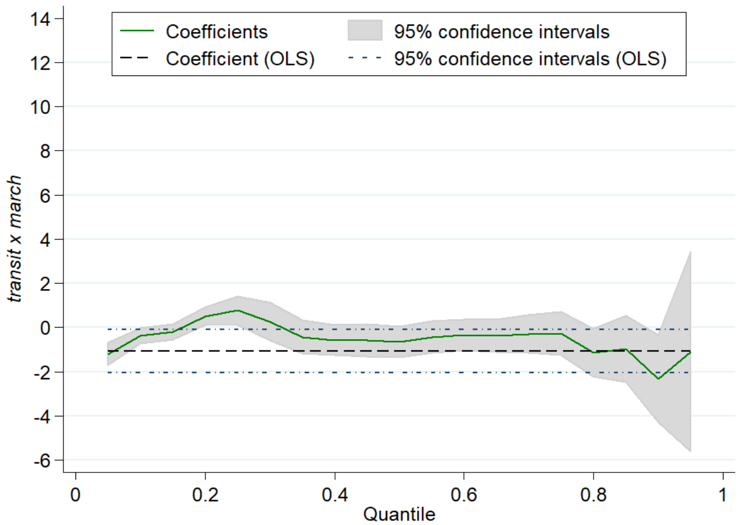


Figure 7: Quantile regression coefficients (*internal_commuting* in March) ▸ Back

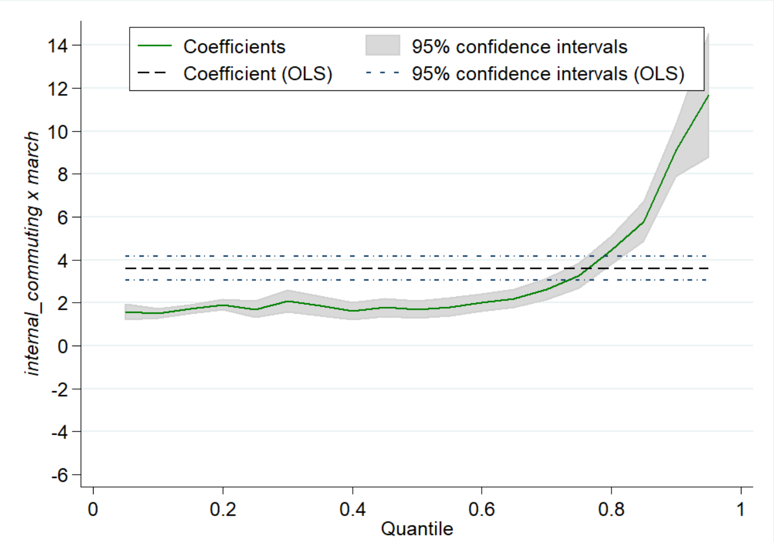


Figure 8: Quantile regression coefficients (*external_commuting* in March) ▸ Back