

Europe, we have a problem!
The Economic Costs of Border Closures during Pandemic

Ketevani Kapanadze[†] and Mariola Pytlikova[‡]

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[†]European Research University

[‡]SYRI, CERGE-EI, Charles University Prague and AIAS, Aarhus University



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Motivation

- Almost 30 years have passed since the establishment of Schengen Area
- Pandemic: disrupting EU Integration and *borderless* market

The mayors of Nova Gorica (Slovenia) and Gorizia (Italy) held a symbolic meeting at a table placed on the closed border, divided square that separates two countries



SYRI

COVID-19 Border Closures: Macro Spatial Perspective

Most studies assess the *national-level economic and health effects* of border closures and travel restrictions during the pandemic (*Eckardt et al., 2021; Gros, 2021; Broughel & Kotrous, 2021; Rodríguez-Pose & Burlina, 2021*)

- These studies largely overlook economic impacts, especially in cross-border areas.
- Empirical studies on the pandemic have underexplored local-level impacts, especially at the city and municipality scale (*Khan et al., 2023*).

COVID-19 Border Closures: Micro Spatial Perspective

We study the economic effects of a natural experiment — the re-introduction of border controls within the Schengen Area during the first wave of pandemic.

- Provide new evidence on the localized economic consequences of border closures in European municipalities.
- Use high-frequency, granular data (nighttime lights) to capture how border closures caused *immediate* economic disruptions in cross-border municipalities.
- Move beyond national and regional level analyses by focusing on spatial heterogeneity and underlying mechanisms at the local level.

Border closures during COVID-19 led to a decline in economic activity in border municipalities, as measured by night-time lights.

Heterogeneity:

- *New EU member states and smaller municipalities* were more negatively affected.

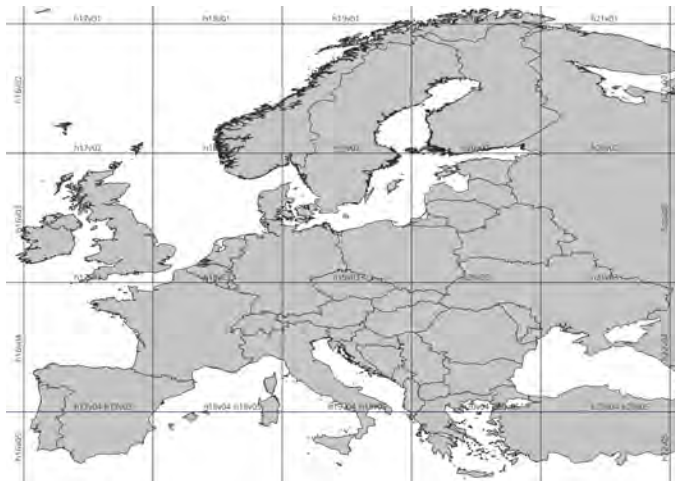
Mechanism: purpose of movement mediates the economic impact

- Losses were concentrated in areas with **input-driven mobility** (e.g., work, services, shopping).
- No negative effects—and even gains—occurred where mobility was **choice-driven** (e.g., leisure, social visits).



NASA's Black Marble Product





Black Marble Land Tiles in the Schengen Area

Data I: Outcome Variable – Nighttime Lights

- VIIRS (Visible Infrared Imaging Radiometer Suite)
- Monthly data in 2018, 2019, 2020
- 500 × 500 meter grid cells in 88,000 Schengen municipalities
- Pixel-level radiance (0–5570 digital number)

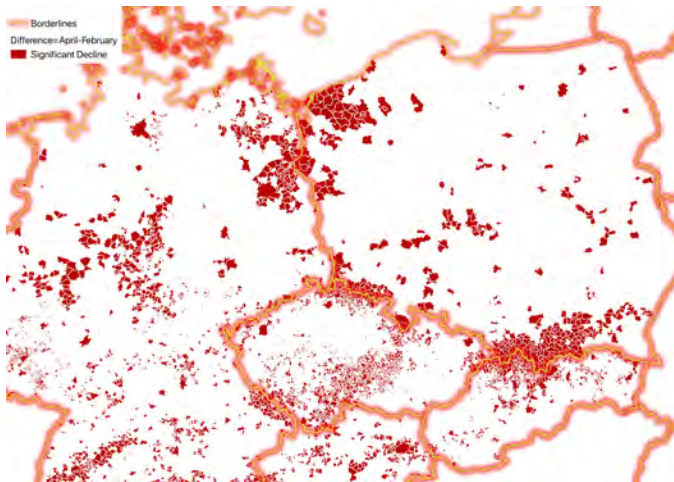
Data II: Heterogeneity variables– Administrative Data (ARDECO, European Commission)

- LAU-2 level: population, population density, geographic area

Data III: Mechanism – Interreg A Cross-border cooperation survey

- Approx. 40,000 respondents across European border regions
- Identifies reasons for cross-border mobility: *input driven* (e.g., shopping, work, services) vs. *choice-driven* (e.g., family/friend visits, leisure)

Pre-analysis: NTL in April vs. February 2020



The Western-Eastern Frontier: Unequal Impacts of Border Closures



$$NTL_{it} = \alpha + \beta Border_i + \gamma (Border_i \times Lockdown_t) + d_t + D_C + \epsilon_{it}, \quad (1)$$

Where:

- NTL_{it} is log nightlight intensity in municipality i at time t ,
- $Border_i$ is a dummy variable equal to 1 if unit i is a border municipality and 0 otherwise,
- $Lockdown_t$ is a dummy equal to 1 if a lockdown is in effect at time t .
- $(Border_i \times Lockdown_t)$ captures the differential effect of lockdowns on border municipalities relative to interior municipalities

Overall: Nightlights Decline in Border Cities Following Border Closures

	I	II	III	IV
Border Cities \times Closure	-0.032** (0.010)	-0.031*** (0.005)	-0.022* (0.009)	-0.017*** (0.004)
Num. Obs.	608,630	608,630	917,445	917,445
Adj. R ²	0.025	0.772	0.015	0.774
Clustered SE	✓	✓	✓	✓
FE: LAU		✓		✓
FE: Month		✓		✓
Counterfactual Years	2018	2018	2018 & 2019	2018 & 2019

- Border closures lead to a significant decline in night-time lights in border municipalities.
- Effect remains *robust* across model specifications and counterfactual years.

	Inverse Area	Inverse Population
Border Cities \times Closure \times Size	-0.268*** (0.047)	-0.343*** (0.084)
Num. Obs.	608,630	601,915
R ² Adj.	0.773	0.785
Clustered SE	✓	✓
FE: LAU	✓	✓
FE: Month	✓	✓

- We estimate that for *smaller and less populated cities*, border closures lead to a stronger decline in night-time lights.
 - Small local economies are *more* dependent on cross-border flows.
 - They are less resilient to disruptions in cross-border mobility.

Heterogeneity II: West vs. East

	Western	Eastern	West–West	West–East
Closure	-0.584*** (0.003)	-0.504*** (0.008)	-0.736*** (0.010)	-0.446*** (0.010)
Border × Closure	0.028*** (0.005)	-0.141*** (0.010)	0.163*** (0.011)	-0.306*** (0.018)
Observations	502,858	105,772	172,432	31,623
Adj. R ²	0.775	0.841	0.854	0.877
FE: LAU, Month	✓	✓	✓	✓
SE clustered	✓	✓	✓	✓
Partner Border	West & East	West & East	West	East

- Eastern border areas show an *expected* decrease in NTL.
- Western border areas show an *unexpected* increase in NTL.
 - Cities in West bordering **West**: NTL **increases** due to a boost in local economies from eliminated cross-border competition and redirected demand to domestic businesses.
 - Cities in West bordering **East**: NTL **declines** due to disrupted flows of cheap labor (from the East) and affordable consumption (in the East).



Mobility Purpose	Coefficient	Standard Error
Social (Family + Friends)	0.053***	(0.014)
Leisure	0.285***	(0.017)
Services	-0.416***	(0.036)
Shopping	-0.169***	(0.014)
Business	-0.130***	(0.032)
Observations	292,570 (in each model)	
Adjusted R^2	0.831–0.833	
FE: LAU_ID & Month	Yes (all models)	

- **Input-driven mobility** (services, shopping, business):
 - Closure disrupts these flows → **decline in NTL** due to lower income and consumption.
- **Choice-driven mobility** (leisure, social visits):
 - Closure redirects demand back to domestic economy → **NTL increases.**



Border closures reduced local economic activity in cross-border municipalities, as shown by declines in night-time lights (NTL).

- The effects were highly uneven:
 - Small and Eastern peripheral municipalities were hit harder — less economic resilience.
 - Western cities bordering the East lost; those bordering the West gained.
- Purpose of mobility matters:
 - Where cross-border mobility facilitated access to jobs, services, or shopping, border closures adversely affected local economies (NTL ↓).
 - Where mobility was mainly choice-driven for *social or leisure reasons*, closures redirected time and spending locally — leading to increased activity (NTL ↑).
- Understanding of the purpose behind cross-border flows could have supported more adaptive and place-sensitive policies.

Thank you!

✉ ketevani.kapanadze@eruni.org

✉ mariola.pytlikova@cerge-ei.cz