OSSERVATORIO SULLE ECONOMIE EMERGENTI - TORINO
TURIN CENTRE ON EMERGING ECONOMIES

VISUALISING THE EFFECTS OF COVID-19 CONTAINMENT MEASURES IN THE ARAB STATES

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Introduction

Arab countries are among those that have employed precautionary measures to tackle the diffusion of COVID-19, acting in advance to avoid the dramatic consequences of the virus. By exploiting new publicly available data sets, we obtained a real-time analysis of the economic and environmental consequences of the measures undertaken to tackle the spread of the COVID-19 pandemic. The empirical focus is on a selected group of countries in the Arab region, illustrative of the socio-dynamics of the area. This allows to "visualize" the regions that have been most negatively affected by the contagion containment measures, using near-real time data, such as the drop in emitted luminosity (NTLs) and the reduction in NO2 presence in the atmosphere as proxies for economic activity and urban settlement dynamics (Henderson, Storeygard and Weil, 2012). This framework may offer policymakers significant insight enabling them to implement cost-effective, regionally targeted policies to help mitigate the economic damages caused by coronavirus. Moreover, an investigation on the potential correlation among the collapse of oil prices in the region, the drop in NO2 emissions and mobility trends data shows how these indicators are significantly interconnected. Finally, exploiting the estimated elasticities of GDP to variation in NTLs, as in Giovannetti and Perra (2020), we provide alternative measurements of GDP loss. By extrapolating GDP loss from the reduction in NTLs, different scenarios have been provided for each country, with slightly different projections with respect to those released by the International Monetary Fund (IMF) and the World Bank.

This article is an extract of the presentation on "The Covid-19 crisis in countries of the South shore of the Mediterranean" at the workshop on "Emerging economies during and beyond the Covid crisis: insights and perspectives".

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Related Literature

Addressing the urgency of the COVID-19 crisis calls for researchers to employ new digital millennium tools. The Day/Night Band (DNB) sensor of the Visible Infra-red Imaging Radiometer Suite (NOAA, 2013) is a valuable tool for extrapolating global daily measurements of nocturnal visible and near-infra-red lights, which can be used as effective proxies for economic activity (Henderson, Storeygard and Weil, 2012). The sensor represents a new generation of quality NTL products that allow for better monitoring of nighttime phenomena, giving new insights for applied studies (Levin and others, 2020). Equally, the European Space Agency (ESA) has recently released a new environmental air quality data set, collected through Sentinel-5P satellite using TROPOMI (a tropospheric monitoring instrument) (Goddard Earth Sciences Data and Information Services Center, 2019). Similarly, nitrogen dioxide (NO_2), a trace-gas toxic component, may be considered a valuable proxy for human activities, since it is the result of anthropogenic events and natural processes, such fossil fuel combustion from vehicles and power plants, and also lighting (Ogen, 2020; Doll, Muller and Elvidge, 2000). The use of these alternative data sources is usually associated with countries with a weak statistical and administrative system—namely developing countries—which cannot rely on swift, solid and trustworthy data.

To build a holistic picture of the economic damages caused by the measures, these data were mapped for each country to show the change from pre- to post-lockdown/containment measures, both in terms of NTLs and NO_2.

Key Findings

In the south shore of the Mediterranean, Tunisia, Morocco, Jordan and Egypt were severely hit by the pandemic in terms of production slowdown. Strong reductions registered in NO_2 emissions seem to be consistent and severe across all the Tunisian territory, with an average NO_2 emissions reduction of approximately -29.77%. The main touristic destinations are the most severely damaged by the lockdown. Tourism is the second largest contributor to the Tunisian economy, therefore the complete shutdown of all the premises may have had devastating consequences in terms of economic and social recovery. NO_2 emissions have experienced a generalised and significant drop for all the Moroccan territory, averaging -39.28%. The most severe variations were concentrated in the main cities of Rabat, Tangier, Casablanca and Marrakesh. The observed drop in NTLs was around 1%, even though in some areas it peaked at 6.3%. The most affected places were the major population centres and tourist destinations. In Jordan, NO_2 underwent an average negative drop of 42% for the most hit areas, but it stands on a countrywide average variation of -16%. The worst impacted areas were found in western Jordan, which borders with Israel and Palestine. All the major tourist attractions and tourist industry facilities are condensed within this strip. The registered drop in NTLs does not seem to involve the main city centres, but rather the areas surrounding the major tourist hubs, like Petra, Crusader Castle Montreal and Wadi Rum. Egypt is among the countries that have experienced the highest recorded drop in terms of NO_2 emissions with an estimated average drop of -55.74%. The reduction in luminosity, meanwhile, has been less dramatic, at around 3–4%. However, the maps show that although the country has undergone a generalized reduction in both luminosity and emissions, the areas that have seen the worst impact are those that follow the course of the Nile. Similarly to Tunisia and Morocco, tourist hotspots in particular have been most affected by the crisis.
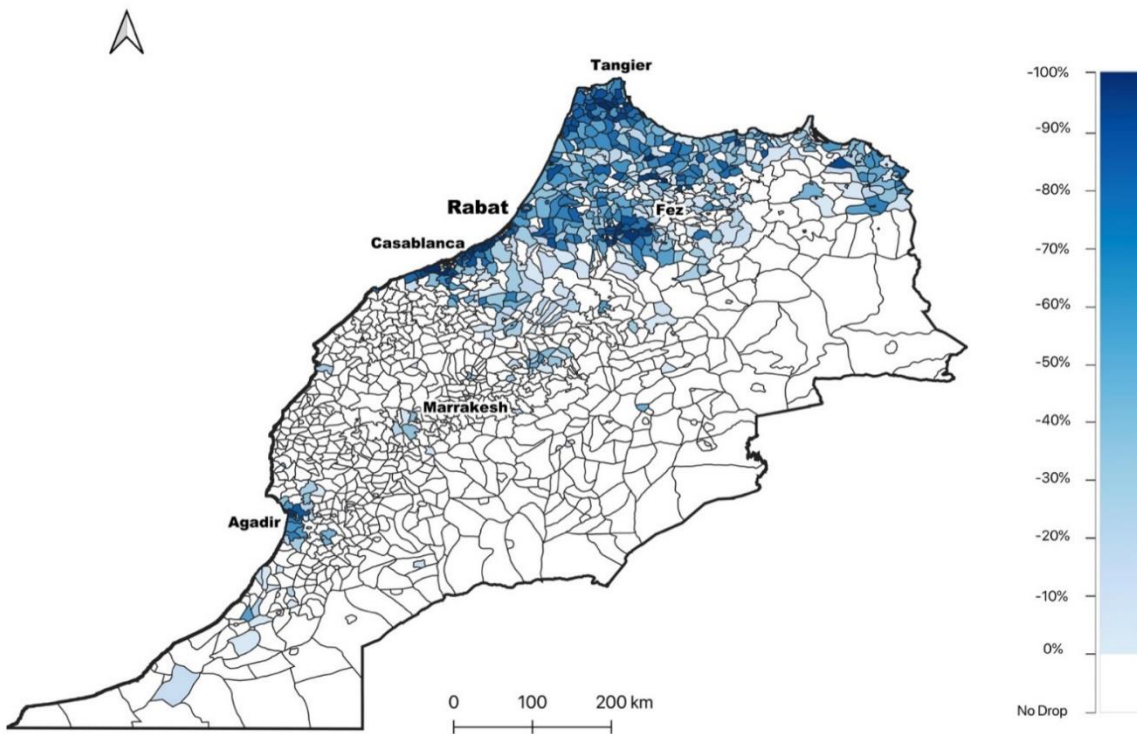
Figure 1. NO2 variation in Morocco

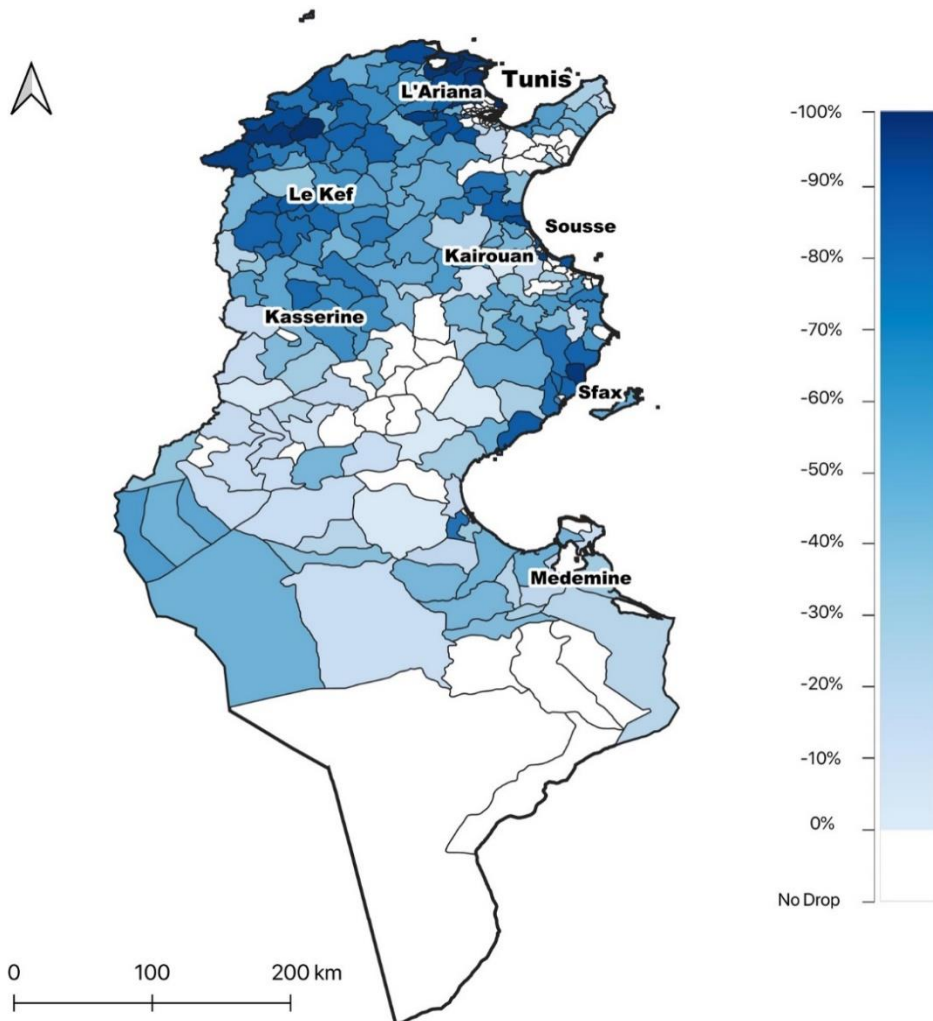*Figure 2. NO2 variation in Tunisia*
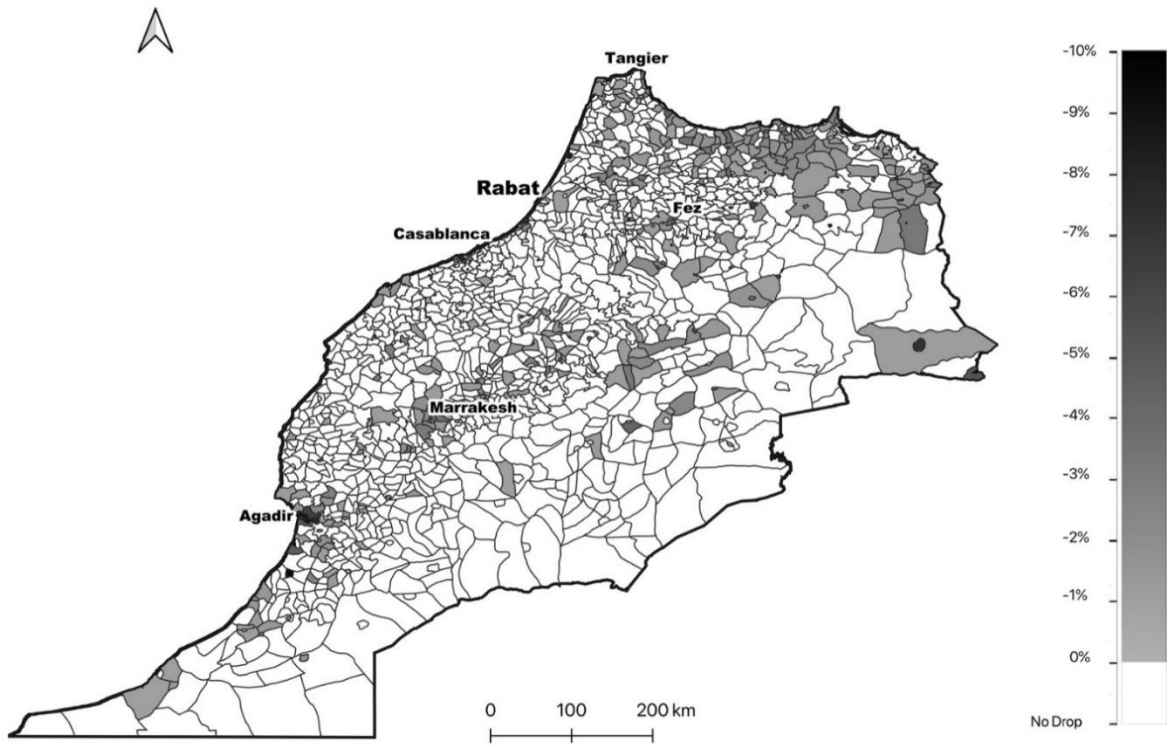
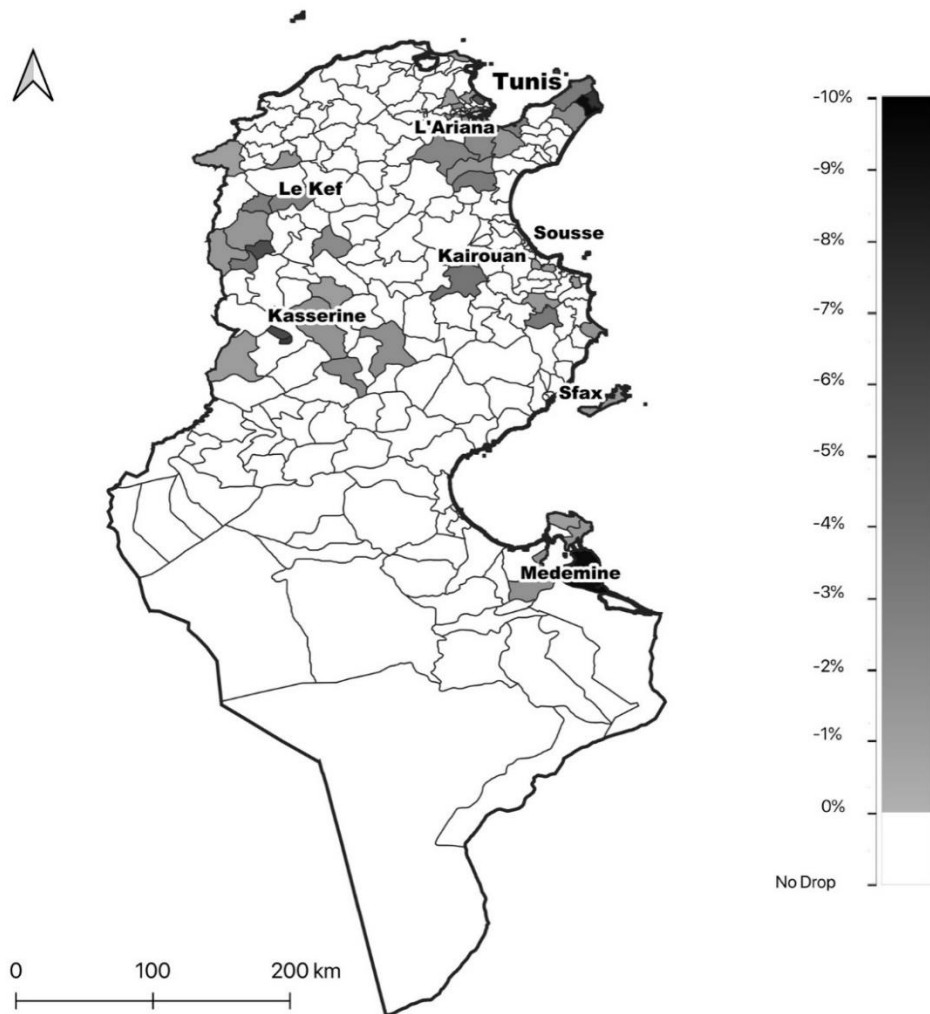*Figure 3. NTL variation in Morocco*

Figure 4. NTL variation in Tunisia

Key conclusions and policy implications

The employment of satellite data may give significant new insights into the creation of alternative ways of measuring economic outcomes to assess the impact of exogenous shocks. At the same time, it is possible to identify the most affected areas, allowing to deploy specifically targeted economic and social policies which take into consideration the spatial heterogeneity of each country.

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