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# Understanding Regional Disparities in the MENA Region Before and During COVID-19: A Socio-Economic Mapping Approach

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**Understanding Regional Disparities in the MENA Region Before and During COVID-19: A Socio-Economic Mapping Approach****Comprendre les disparités régionales dans la région MENA avant et pendant la COVID-19 : une approche de cartographie socio-économique**Abderraouf MTIRAOUI<sup>1</sup>

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**Abstract:** *The purpose of this paper is to conduct a comparative analysis of two distinct periods: before and during the COVID-19 pandemic. The study aims to illustrate, through cartographic representations, the spatial distribution across the majority of MENA countries, while examining the evolution of key socio-economic indicators such as education, health, and GDP growth in 2017 and 2020. The paper highlights the impact of the COVID-19 pandemic on various socio-economic indicators, with a particular focus on demographic growth rates in the MENA region during this period. Using ArcGIS Pro software, which facilitates the processing, analysis, and visualization of geospatial data, the study explores geographical disparities using two analytical methods: comparative analysis between countries and geospatial analysis.*

**Keywords:** COVID-19 epidemic, Mapping, Socio-Economic indicator, Spatial Distribution.

**JEL Classification:** N70, F18, O44 and C33

**Résumé :** *L'objectif de cet article est de mener une analyse comparative entre deux périodes distinctes : avant et pendant la pandémie de COVID-19. L'étude vise à illustrer, à l'aide de représentations cartographiques, la répartition spatiale dans la majorité des pays de la région MENA, tout en examinant l'évolution des principaux indicateurs socio-économiques tels que l'éducation, la santé et la croissance du PIB en 2017 et 2020. Le document met en évidence l'impact de la pandémie de COVID-19 sur divers indicateurs socio-économiques, en mettant particulièrement l'accent sur les taux de croissance démographique dans la région MENA pendant cette période. À l'aide du logiciel ArcGIS Pro, qui facilite le traitement, l'analyse et la visualisation des données géospatiales, l'étude explore les disparités géographiques à l'aide de deux méthodes analytiques : l'analyse comparative entre les pays et l'analyse géospatiale.*

**Mots-clés :** Épidémie de COVID-19, cartographie, indicateur socio-économique, répartition spatiale.

**Introduction**

The COVID-19 pandemic has triggered unprecedented disruptions across socio-economic systems worldwide, with the Middle East and North Africa (MENA) region being significantly affected. The pandemic's economic repercussions have been particularly pronounced in sectors heavily reliant on mobility and international interactions, such as

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transport and tourism. These sectors experienced sharp declines due to prolonged travel restrictions and recurrent waves of infections in multiple countries (Mtiraoui, 2021). According to the International Monetary Fund (IMF, 2020), the majority of MENA economies experienced severe contractions in 2020. Beyond the direct economic consequences, the pandemic exposed critical vulnerabilities in the region's public health infrastructure. Many MENA countries, historically constrained by limited public health budgets and inadequate healthcare resources, were ill-prepared for the magnitude of the crisis (World Health Organization (WHO), 2020). This fragility was further exacerbated by the absence of comprehensive universal health coverage in numerous countries, leaving households exposed to significant out-of-pocket medical expenses and increasing socio-economic inequalities. Such systemic weaknesses underscored the urgent need for strengthened healthcare systems and social protection mechanisms. Education has arguably been one of the most profoundly impacted sectors. The sudden shift to remote learning revealed and intensified pre-existing disparities in access to digital infrastructure and technology, especially among disadvantaged populations and rural communities (Abu-Rahma, 2020; Zaki, 2020). These educational disruptions risk generating long-term adverse effects on human capital development and social mobility across the region. Consequently, the pandemic highlighted the interdependencies between health, education, and economic systems, emphasizing the multi-dimensional nature of socio-economic resilience. This study aims to systematically examine the socio-economic impacts of the COVID-19 pandemic in the MENA region by comparing key development indicators, namely education, health, and GDP growth between 2017 and 2020. Employing geospatial analytical techniques through ArcGIS Pro, the research maps the spatial distribution and temporal changes in these indicators across MENA countries, with a focus on revealing intra-regional disparities and identifying vulnerable populations. The paper is structured as follows: section two reviews the literature and synthesizes scholarly work on the pandemic's impact on health, education, and economic performance. Section three presents the methodology and details the geospatial data collection and analytical procedures implemented using ArcGIS Pro. Section four discusses and interprets the spatial patterns and trends uncovered through the analysis, highlighting policy-relevant findings. Finally, the Conclusion underscores the implications of these results for policymakers and advocates for the formulation of targeted interventions designed to bolster the MENA region's resilience against future public health and economic crises.'

## 1 Literature review

### 1.1 The influence of trade liberalization on economic growth<sup>1</sup>

The COVID-19 pandemic has had a significant and far-reaching impact on the global economy, triggering a widespread recession that affected nearly all regions, including the MENA region.

According to the International Monetary Fund (IMF, 2021), global GDP contracted by approximately -3.5% in 2020, while the MENA region experienced a comparable decline of -3.9%. This economic downturn was further compounded by long-standing geopolitical tensions, such as the ongoing conflicts in Yemen and Libya, and a dramatic drop in oil prices,

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<sup>1</sup> Mtiraoui, A. (2020) : "The action of public power and Economic Growth: Application to the health sector in the MENA region" *hal.archives-ouvertes.fr/hal-02523118/document*.

an especially destabilizing factor for oil-dependent economies in the region. Mikhed et al. (2020) note that Gulf countries like the United Arab Emirates and Qatar were relatively better positioned to absorb the shock due to their substantial financial reserves and diversified economic structures.

Conversely, nations such as Algeria and Egypt were particularly vulnerable, grappling with the dual shocks of the pandemic and plummeting oil revenues, which led to significant fiscal and macroeconomic instability. These circumstances exposed the region's overreliance on hydrocarbons and emphasized the urgent need for structural economic reforms and diversification to build long-term resilience.

In this context, the role of trade openness has gained renewed attention as a potential lever for recovery and sustainable growth. Theoretical and empirical studies have long emphasized the positive effects of trade liberalization on economic performance. Grossman and Helpman (1991) and Levine and Renelt (1992) argue that trade openness facilitates the adoption of advanced technologies and promotes productivity through channels such as learning-by-doing and technology transfer.

Empirical research supports this theoretical foundation. Sachs and Warner (1995), in their seminal work on 122 countries between 1970 and 1989, demonstrated that trade openness significantly contributes to stronger economic growth, particularly in developing economies. Similarly, studies by Dollar (1992), Edwards (1993), Frankel and Romer (1999), Bosworth and Collins (2003), and Wacziarg and Welch (2008) consistently confirm a robust positive relationship between liberalized trade regimes and improved economic outcomes. Focusing specifically on the MENA region, Caupin and Saadi-Sedik (2003) examined the dual nature of trade openness, acknowledging its potential to expose economies to external shocks while also recognizing its long-term contribution to economic resilience. In the wake of the COVID-19 crisis, these findings have gained renewed relevance. The pandemic highlighted the vulnerabilities of global supply chains and underscored the need for enhanced regional trade integration and economic diversification to mitigate future shocks.

Taken together, the literature suggests that while trade openness can amplify short-term exposure to volatility, it remains a key driver of long-term growth and resilience, especially when complemented by institutional reforms, improved governance, and targeted investment in strategic sectors. Incorporating post-pandemic dynamics into this analytical framework provides a more relevant and timely foundation for understanding the current economic challenges facing the MENA region.

## **1.2 Economic and Trade Policy Dynamics in the MENA region**

Trade policy is inherently multifaceted, positioned at the crossroads of domestic economic priorities and international geopolitical dynamics. In the context of Tunisia, understanding the evolution and challenges of its trade policy requires a critical analysis of its strategic orientations in both exports and imports. Historically, the MENA region has viewed trade liberalization as a central pillar of economic development, where the expansion of exports and services has served as a key avenue for attracting foreign capital and promoting sustainable growth (Abedini & Péridy, 2008).

Nevertheless, Tunisia has struggled to fully harness the transformative potential of trade openness. The country has endured chronic trade deficits and a marked decline in trade performance, particularly over the past decade (Ayadi & Mattoussi, 2014). These issues are compounded by structural limitations such as a narrow export base, dependence on traditional markets, and limited product diversification. Although the region has signed several trade agreements—both bilateral and multilateral, many of these have not yielded balanced outcomes. Tunisia, like other MENA economies, continues to maintain trade deficits with key partners, indicating the need for a more adaptive and results-oriented trade strategy.

To address these challenges, Tunisia must recalibrate its trade policy by prioritizing high-value-added exports and improving trade competitiveness. This involves not only rationalizing imports to protect strategic industries but also boosting the performance of dynamic sectors that offer comparative advantages. Services, in particular, present a promising area for expansion. Tourism, healthcare, ICT, and offshore business services are sectors with strong potential to drive inclusive growth and generate foreign exchange (Zouari & Boughzala, 2017; Amara & Jemmali, 2018).

Moreover, the social and solidarity economy, often overlooked in mainstream policy discourse, offers an untapped opportunity to promote sustainable development. Its integration into the national economic framework can help reduce social inequalities, support entrepreneurship, and strengthen community-based value chains. Given the socio-economic vulnerabilities exposed by the COVID-19 crisis, leveraging this sector has become even more relevant.

In sum, achieving long-term economic resilience in Tunisia requires a comprehensive and forward-looking trade policy. This strategy must go beyond conventional liberalization frameworks to include institutional reforms, investment in infrastructure, and regional integration. A more diversified and inclusive approach to trade, one that incorporates social equity, innovation, and digital transformation, will better position Tunisia to navigate global uncertainties and enhance its economic sovereignty.

### **1.3 Econometric Approach: A Case Study**

To establish causal relationships between key socio-economic variables, this study adopts a rigorous econometric framework based on multiple linear regression analysis. This methodological approach enables the quantification of the influence exerted by critical independent variables, such as trade openness, GDP per capita, foreign direct investment (FDI), and public expenditure on health and education, on economic growth and broader socio-economic outcomes in the MENA region.

The use of econometric models in development and growth studies is well documented in the literature. For instance, Barro (1991) and Levine & Renelt (1992) have demonstrated the effectiveness of cross-country regression analysis in exploring the determinants of economic growth. These models help identify statistically significant relationships between policy variables and growth performance across countries and time periods. To ensure the robustness of the estimations and minimize biases, the model controls for key econometric issues such as multicollinearity, heteroscedasticity, and autocorrelation, common problems in cross-sectional

and panel data analysis (Gujarati & Porter, 2009). Diagnostic tests such as the Variance Inflation Factor (VIF), Breusch-Pagan test, and Durbin-Watson statistic are used to detect and address these problems, thereby ensuring the reliability of the estimated coefficients.

To improve the causal interpretation of the results, the study further considers advanced econometric techniques. Fixed-effects or random-effects panel models (Baltagi, 2005) are employed to account for unobserved heterogeneity across countries that may bias the results. In contexts where endogeneity is suspected such as reverse causality between economic growth and investment Instrumental Variable techniques (Wooldridge, 2010) are considered. For example, lagged variables or external shocks may serve as valid instruments to isolate exogenous variation.

Furthermore, when examining the effects of the COVID-19 pandemic on socio-economic outcomes, the Difference-in-Differences method is especially relevant. This technique compares the changes in key indicators before and after the pandemic across countries with varying levels of exposure to COVID-19-related shocks (Angrist & Pischke, 2009).

The Difference-in-Differences method allows for the estimation of causal effects under relatively mild assumptions, making it particularly useful in quasi-experimental designs. By leveraging these econometric tools, the study moves beyond simple descriptive statistics and provides more robust empirical evidence of the causal links between development policies, institutional factors, and socio-economic performance in the MENA region. This contributes to a deeper understanding of the structural challenges and policy levers relevant for post-pandemic recovery and long-term resilience.

## 2 Methodology

The literature review focuses on analyzing and comparing socioeconomic indicators in two distinct periods: before and during the COVID-19 pandemic. Specifically, it examines data from 2017, the year just before the pandemic, and from 2020, during the pandemic, using mapping and spatial distribution techniques for the MENA region. The methodology section describes the use of ArcGIS Pro for analyzing spatial data.

### a. Hypothesis

**H<sub>1</sub>:** Socioeconomic indicators, such as GDP, played a key role in driving economic growth in the MENA region prior to the COVID-19 pandemic, specifically in 2017. However, the impact of these indicators on economic growth was significantly altered during the COVID-19 pandemic in 2020.

**H<sub>2</sub>:** Trade and Foreign Direct Investment (FDI) were key drivers of economic growth in the MENA region before the COVID-19 pandemic. During the pandemic, however, these indicators are expected to have been negatively impacted, with trade disruptions and reduced foreign investment affecting economic performance in 2020.

**H<sub>3</sub>:** Demographic factors, such as changes in population behavior and awareness, influenced the entrepreneurial capacity of society. According to Caballero and Hammour (1994), these shifts could have led to changes in entrepreneurial activity during the pandemic. Additionally, as Duhautois (2000) notes, the entrepreneurial potential is typically higher among

younger individuals, and demographic shifts could have further impacted the propensity to start new businesses during the COVID-19 period. Sample, Period and Data

**Sample:** Our sample of countries is made up of 16 countries from the MENA region to Know: six African countries and ten Gulf countries. In fact, this study region is made up of 16 countries namely: Bahrain, Oman, Kuwait, Jordan, Iraq, Iran, Yemen, United Arab Emirates, Qatar, Saudi Arabia, Tunisia, Turkey, Morocco, Egypt, Sudan, and Algeria<sup>1</sup>.

**Period:** We compare the socioeconomic indicators between two different situations before and during COVID-19 namely the year (2017) just before COVID-19 and the year 2020 during COVID-19.

**Data:** We have formed an international database available in "*World Bank CD: WDI*".

## b. Definitions and measures of variables

-Economic growth indicator (GDP) : Levine et al., 2000, Beck et al., 2000, and Beck and Levine, 2004) noted (GDP). Likewise, Mohem and Mairesse (1999, 2001) give a few orders of magnitude on the contribution of R&D to GDP.

-*Trade Indicator (TRADE)*: For our work, the ratio of trade value (export + import) / GDP to capture the degree of openness (Sachs and Warver 1995) noted (TRADE).

-*Investment indicator (INV)* : Business investment includes gross fixed capital formation (INV) and stock change which is considered a catalyst for any growth variable because it makes human labor more efficient.

-*Foreign direct investment indicator (FDI)*: **One** variable is justified by the abundant literature which states that foreign direct investment has a positive impact on economic growth such as Ikiara, Moses M. (2003) and Fosto, which prove that technology transfers have a positive effect on growth and noted (FDI).

-*The demographic indicator (Pop)* : The POP indicator represents the population growth rate reported by (WDI)

-*Health indicator* : The health indicator (PHE) Public expenditure denoted on health as a percentage of GDP. (WDI)

-*Education indicator*: education indicator (PEE) Public expenditure denoted on education as a percentage of GDP. (WDI).

Evaluating socio-economic indicators at the average national level provides insight into the overall development achieved by a country, but it remains analytically limited. This limitation becomes particularly apparent when considering the wide dispersion in the spatial

<sup>1</sup> Mtiraoui, A. (2020) : “The action of public power and Economic Growth: Application to the health sector in the MENA region” [hal.archives-ouvertes.fr/hal-02523118/document](http://hal.archives-ouvertes.fr/hal-02523118/document).

and social distribution of investments in the social and economic factors that are essential for development.

The general data on GDP, trade, and foreign direct investment (FDI), for example, can mask significant regional disparities, especially in rural or isolated areas where access to social, educational, and healthcare facilities remains a persistent challenge. In these areas, socio-economic development is often hindered by a lack of infrastructure, resistance due to cultural factors, and a general ignorance of the potential benefits these services could provide. Furthermore, the persistence of poverty, both in monetary and human terms, limits the ability of these populations to take advantage of available opportunities, further exacerbating the disparities.

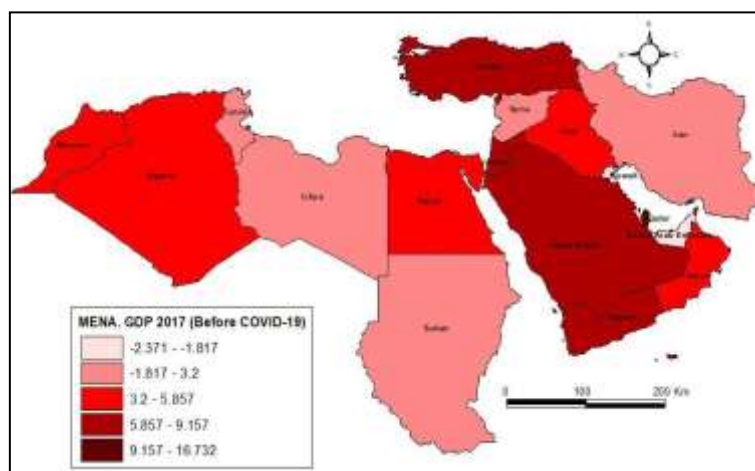
During the COVID-19 pandemic, these disparities became even more pronounced. The socio-economic impact of the pandemic highlighted the inequities in the distribution of resources and investments. For example, while urban areas with better infrastructure and greater access to resources were more capable of weathering the economic and social disruptions caused by COVID-19, rural and disadvantaged regions faced heightened challenges. Accessibility to healthcare became a crucial issue, and the existing gaps in education, trade, and FDI were further widened as businesses shut down, supply chains were disrupted, and foreign investments declined.

### 3 Mapping and spatial distribution Mena region

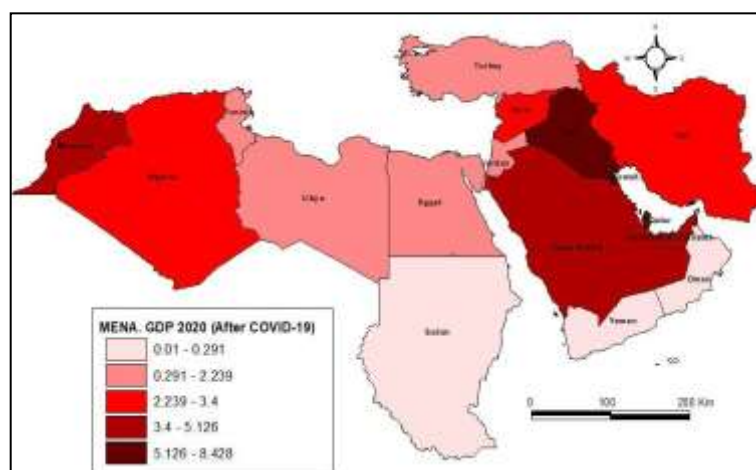
#### 3.1 The evolution of economic indicators before and during COVID-19

##### 3.1.1 Comparison between the two GDP growth situations (2017 and 2020)

Figure 1: GDP growth (2017)



Source: The author

**Figure 2: GDP growth (2020)**

Source: The authors

**- Interpretation:**

The recent escalation of conflict between Saudi Arabia and Iran has intensified existing geopolitical tensions in the MENA region, triggering a series of economic and political mechanisms that could further destabilize already fragile economies. One immediate consequence is the likely increase in military spending by the countries directly involved and their respective allies. This surge in defense expenditures, particularly in the context of constrained government budgets and declining oil revenues, diverts crucial fiscal resources away from productive investments and social programs, thus constraining overall economic growth. This crowding-out effect limits the government's ability to stimulate other sectors of the economy or invest in long-term development projects.

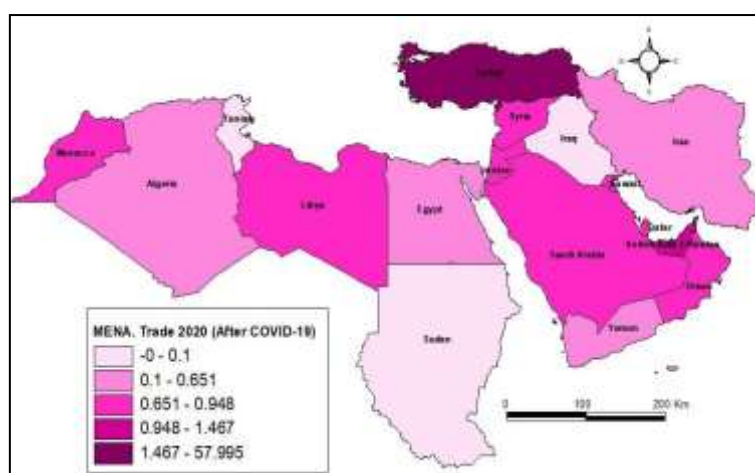
Moreover, heightened geopolitical risks contribute to increased uncertainty, which negatively affects key economic variables such as foreign direct investment (FDI), tourism, and international trade flows. Investors tend to adopt a more risk-averse stance during periods of instability, reducing capital inflows essential for economic expansion and diversification. Tourism, a vital source of revenue and employment in many MENA countries, suffers from travel advisories and security concerns, while trade disruptions arise from both political instability and fluctuating oil prices. These combined effects exacerbate the economic fragility of the region.

Despite these immediate shocks, the persistent structural challenges that have long impeded MENA's growth such as high unemployment, weak institutional frameworks, and reliance on volatile commodity exports remain largely unaddressed. Consequently, the short-term economic outlook remains "cautiously pessimistic," with low average growth rates expected to persist unless significant political and economic reforms occur. In a more optimistic scenario, a political resolution to ongoing conflicts in Yemen, Libya, Iraq, and Syria, coupled with the lifting of sanctions on Iran, could unleash substantial reconstruction and recovery activities. These developments would stimulate economic growth by restoring investor confidence, reactivating oil exports, and encouraging cross-border trade and investment flows. The World Bank's projections for 2016 and 2017, which anticipated growth rates of 4.1% and

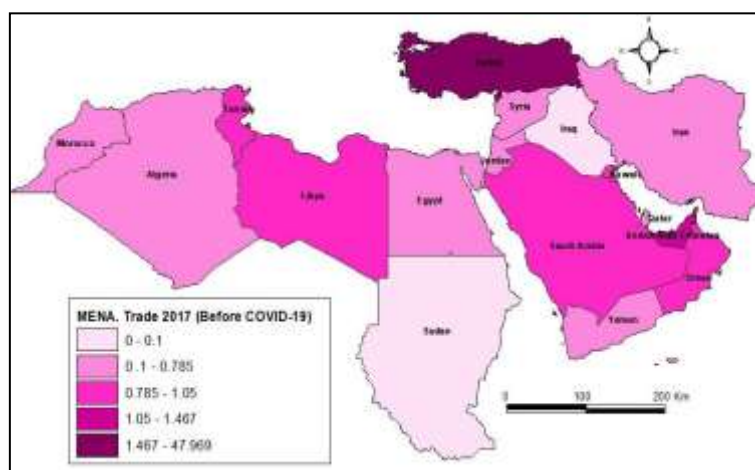
4.4% respectively under such conditions, exemplify the growth potential tied to political stability and regional cooperation. However, the advent of the COVID-19 pandemic introduced a profound layer of uncertainty, disrupting these positive dynamics. Spatial analysis using ArcGIS Pro allows for a nuanced understanding of these regional disparities in economic performance between 2017 and 2020. By mapping growth patterns and contractions, policymakers can identify hotspots of economic downturn linked to conflict zones, oil market shocks, and governance challenges. This spatial dimension is critical for designing targeted interventions that address localized needs rather than broad-brush approaches. Short-term policy responses must focus on cushioning the most vulnerable populations through non-therapeutic social assistance programs, supporting small and medium-sized enterprises (SMEs) to sustain economic activity, and improving tax collection to enhance fiscal space. Such measures can mitigate the immediate socio-economic fallout and prevent deeper poverty traps. For medium-term recovery, comprehensive institutional reforms are indispensable. These reforms involve redefining the state's role from direct market intervention towards facilitation, promoting competitive markets that encourage entrepreneurship and innovation, and accelerating digital transformation to improve productivity and economic diversification. Enhancing regional integration is also vital, as it expands market access, encourages cross-border cooperation, and fosters resilience through economic interdependence. The use of geospatial tools like ArcGIS Pro can further support these reforms by monitoring the impact of policy changes and pinpointing regions that require intensified support. By integrating spatial data analysis with economic policymaking, governments can allocate resources more efficiently and track progress towards sustainable recovery and growth.

### 3.1.2 Comparison between the two trade indicator situations (2017 and 2020)

Figure 3: Trade figures (2017)



Source: the author

**Figure 4: Trade figures (2020)**

**Source:** The author

Before the COVID-19 pandemic, many MENA countries faced mounting pressure to liberalize their trade regimes as a strategic pathway to accelerate economic growth and development. These nations, reliant on technological innovations and knowledge flows from the global economy, understood that opening trade facilitates access to cutting-edge technologies, advanced inputs, and global best practices. Such external collaborations enable domestic industries to innovate, increase productivity, and engage competitively in international markets. This mechanism of trade openness thus acts as a catalyst for industrial upgrading and economic diversification. The onset of the COVID-19 pandemic heightened the critical importance of regional trade integration for maintaining economic stability. The pandemic exposed vulnerabilities inherent in extended global supply chains, characterized by multiple intermediaries and long transport distances, which proved fragile in the face of lockdowns and border closures. As European firms and other global actors consider shortening their supply chains to reduce risk, favoring regional over global networks, MENA countries are presented with an opportunity to reposition themselves as pivotal trade and investment hubs within the region.

However, this transition demands significant reallocation of resources and sectoral adjustments. Policymakers must implement adaptive economic strategies that promote flexibility and resilience. Such policies should support the upgrading of infrastructure, facilitation of trade logistics, and enhancement of business environments to attract quality foreign and domestic investments aligned with emerging regional value chains.

Trade integration in the MENA region is evolving along two complementary dimensions: horizontal and vertical. Horizontal integration focuses on harmonizing trade regulations, customs procedures, and standards across countries to reduce transaction costs and uncertainty, thus enabling smoother cross-border exchanges. Vertical integration, on the other hand, targets sectoral specialization and the development of regional production networks, where intermediate goods cross borders multiple times before final assembly. This specialization increases the value-added content of regional trade and fosters deeper economic interdependence. Achieving successful regional trade integration requires comprehensive reforms aimed at designing coordinated trade and investment policies. Key among these

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reforms is overcoming barriers to Trade-Related Commitments (TRCs) and establishing institutional frameworks that facilitate the smooth operation of regional trade agreements. Furthermore, attracting high-quality investments is essential to support economic diversification, equitable growth, and environmental sustainability within the region.

The pandemic also underscored the importance of rethinking economic and social policies in the context of regional trade, including with Africa, given growing interdependencies. The combined shocks of the health crisis and plummeting oil prices pushed many MENA economies into recession, while restrictive measures like border closures significantly increased the cost of cross-border trade and dampened trade volumes. This downturn particularly affected manufacturing sectors such as electronics and automotive production, which rely heavily on global supply chains, as well as service sectors like tourism that depend on the free movement of people.

Using spatial analysis tools such as ArcGIS Pro, policymakers can map and visualize trade flows between 2017 and 2020 to better understand the heterogeneous impacts of the pandemic on the MENA region. This spatial perspective reveals which countries and trade hubs suffered steep declines and which managed to maintain resilience, providing valuable insights for tailoring future trade policies and regional cooperation frameworks. Importantly, while trade openness has the potential to drive inclusive economic growth, it must be accompanied by broader economic and social reforms to ensure equitable benefit distribution. The mechanisms through which trade liberalization impacts inclusive growth are complex: sectors and populations that are better positioned to compete internationally may experience significant gains, whereas vulnerable industries and workers might face increased competition and job displacement. These uneven outcomes can exacerbate regional disparities if unaddressed (Figure 3 and 4).

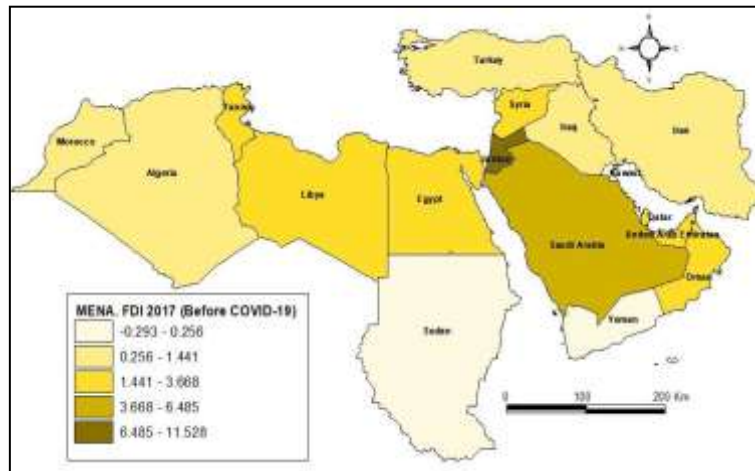
Spatial analysis further allows the identification of geographic areas within MENA countries where trade openness has generated positive economic spillovers or, conversely, where it has heightened economic vulnerability. This granular understanding helps policymakers design complementary measures, such as targeted social safety nets, workforce retraining programs, and regional development initiatives, that mitigate adverse effects and promote balanced growth across the region. By leveraging ArcGIS Pro to analyze the spatial distribution of trade, policymakers can make more informed decisions about which regions require additional support or targeted interventions to ensure that the benefits of trade integration are more evenly distributed across the MENA region. This data-driven approach can also help in identifying potential new trade partners, particularly in Africa, where deeper economic ties could offer new avenues for regional growth and recovery post-COVID-19<sup>1</sup>.

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<sup>1</sup> MENA Economic Update: Trading Together — Reviving Middle East and North Africa Regional Integration in the Post-COVID Era

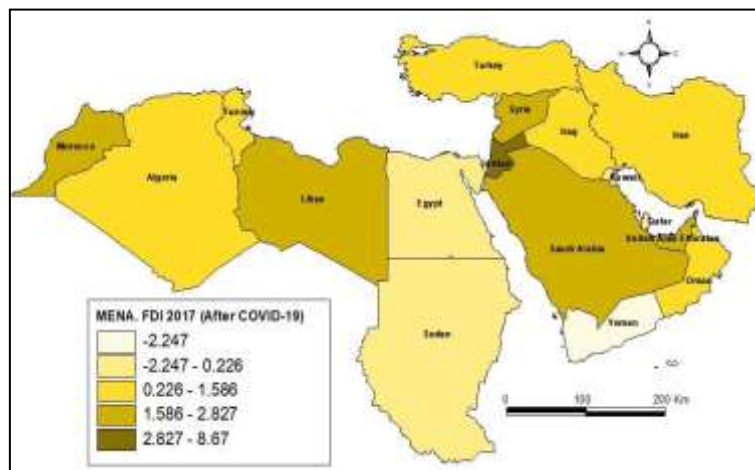
3.1.3 Comparison between the two FDI indicator situations (2017 and 2020)

Figure 5 : Foreign direct investment FDI (2017)



Source: The author

Figure 6 : Foreign direct investment (2020)



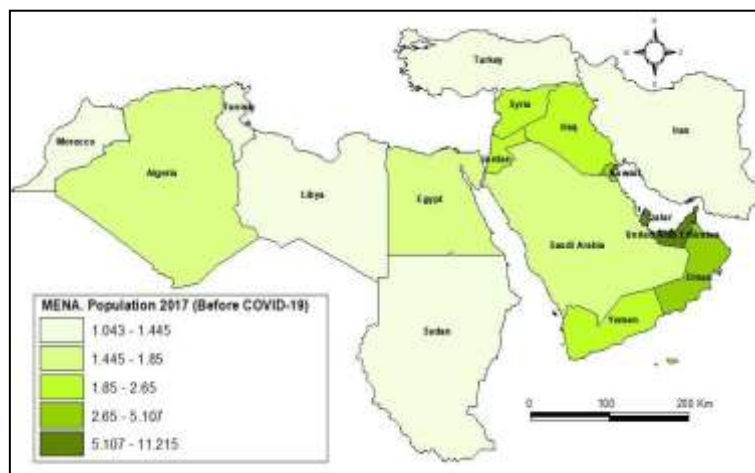
Source: The authors

According to Michelle Davies, partner and international head of clean energy and sustainability at Eversheds Sutherland, sustainable water management is rapidly emerging as a critical focus area for foreign direct investment (FDI) globally. As water scarcity and environmental concerns intensify due to climate change, population growth, and urbanization, investors are increasingly recognizing the strategic importance of sustainable water solutions. These include technologies and infrastructure related to water conservation, wastewater treatment, desalination, and efficient water resource management (Figure 5 and 6). “The challenges as always will be host country support, its investment regime and economic strength, and the fitness for purpose of local regulation – the usual factors.”<sup>1</sup>”

<sup>1</sup> <https://www.investmentmonitor.ai/business-activities/cities/sdg-focus-will-covid-cause-fdi-to-flow-into-water-projects>

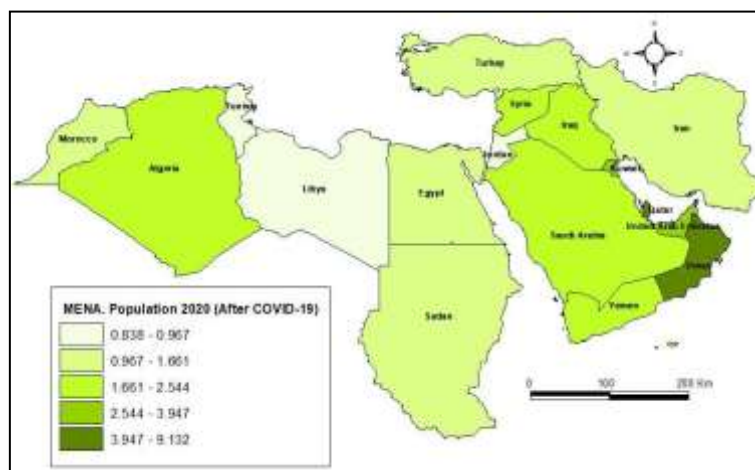
### 3.1.4 Comparison between the two Population indicators (2017 and 2020)

**Figure 7: Mena population (2017)**



Source: The author

**Figure 8: Mena population (2020)**



Source: the author

Before the COVID-19 pandemic, many countries in the MENA region faced significant pressure to liberalize their trade regimes. These nations, heavily reliant on innovations and technologies from the global economy, recognized the importance of external collaborations to stimulate domestic innovation and enhance their competitiveness (Figure 7 and 8).

The opening of trade regimes in many MENA countries has served as a critical conduit for accessing global innovations and technologies, thereby catalyzing industrial progress and economic development (Mtiraoui, 2021). This trade liberalization became particularly vital against the backdrop of the region's rapidly expanding population, which has been exerting significant pressure on domestic economies to meet the rising demand for goods and services (Mtiraoui, 2021; World Bank, 2019). The mechanism at work here is that increased trade openness facilitates the inflow of advanced technologies and inputs, fostering productivity gains and enabling economies to better respond to demographic-driven demand.

Demographic growth in the MENA region, steadily increasing prior to the COVID-19 pandemic, has heightened consumption levels and created a pressing need for enhanced trade integration to supply burgeoning markets (UNDP, 2020). However, despite these rising demands, many countries experienced sluggish economic growth, leading to a challenging dichotomy between demographic expansion and economic stagnation (IMF, 2020). This imbalance underscores the necessity of implementing policies that simultaneously promote trade openness and structural reforms to translate demographic pressure into economic opportunity rather than constraint.

The COVID-19 pandemic further illuminated the strategic importance of regional trade integration as a tool for enhancing economic resilience. The crisis exposed vulnerabilities in long, globalized supply chains, prompting European and other global firms to seek shorter, more reliable regional supply chains, a shift that offers MENA countries a critical opportunity to reposition themselves as regional trade and investment hubs (OECD, 2021). However, the demographic imperative in terms of rising populations demanding more goods, services, and employment, requires significant resource reallocations across sectors, which in turn calls for agile and responsive policy frameworks (Mtiraoui, 2021).

Using spatial data analysis tools such as ArcGIS Pro allows policymakers to map population growth alongside trade flows to identify regions where demographic pressures have most strongly influenced economic activity. This spatial approach aids in diagnosing geographic disparities and resilience during shocks such as the pandemic, enabling more targeted policy responses (World Bank, 2021). For instance, regions experiencing rapid population growth but limited trade expansion may require focused infrastructure investment and trade facilitation measures.

Trade integration in MENA is advancing along two dimensions: *horizontal integration*, which involves harmonizing trade policies and regulations to facilitate smoother cross-border trade, and *vertical integration*, which promotes sectoral specialization and the development of value chains that added greater value within the region (Mtiraoui, 2021). Successful integration demands comprehensive reforms that address trade barriers, improve institutional quality, and attract high-quality foreign and domestic investments (IMF, 2020). These reforms must be designed with demographic realities in mind to ensure that expanding populations contribute positively to economic growth.

The pandemic also presents a pivotal moment to rethink economic and social policies, particularly concerning trade relations with Africa, given the interconnectedness of regional economies. The combined shock of the health crisis and oil price declines plunged many MENA countries into recession, while border closures further increased the cost of doing business, sharply reducing trade volumes in key sectors such as electronics, automotive manufacturing, and services like tourism (OECD, 2021). Demographic growth, especially in urban centers, intensified pressures on these already vulnerable sectors.

Spatial analysis of these disruptions can uncover how trade openness interacts with demographic factors to produce uneven economic outcomes across regions. Trade liberalization alone does not guarantee inclusive growth; it must be complemented by social policies that address inequalities and economic reforms that improve labor market flexibility and skills

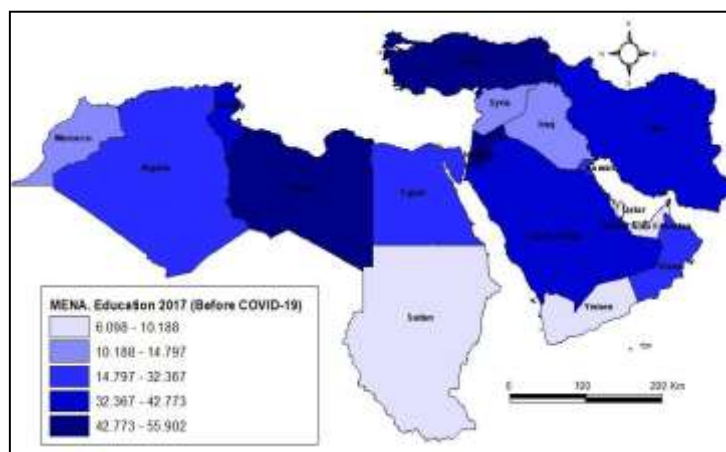
development (Mtiraoui, 2021; World Bank, 2021). Identifying geographic areas where trade reforms have exacerbated disparities helps policymakers design targeted interventions such as social safety nets, vocational training, and infrastructure development to foster equitable growth.

By leveraging ArcGIS Pro, policymakers can gain valuable insights into how population dynamics intersect with trade and economic reforms. This spatial analysis can inform more targeted interventions, ensuring that the benefits of trade integration are distributed more equitably across the region. Furthermore, it can help identify new trade opportunities with regions like Africa, where deeper economic ties could provide a more resilient path forward for MENA countries, particularly those with rapidly growing populations seeking new opportunities post-COVID-19 (Mtiraoui 2020)<sup>1</sup>.

#### 4 The evolution between social indicators before and during COVID-19

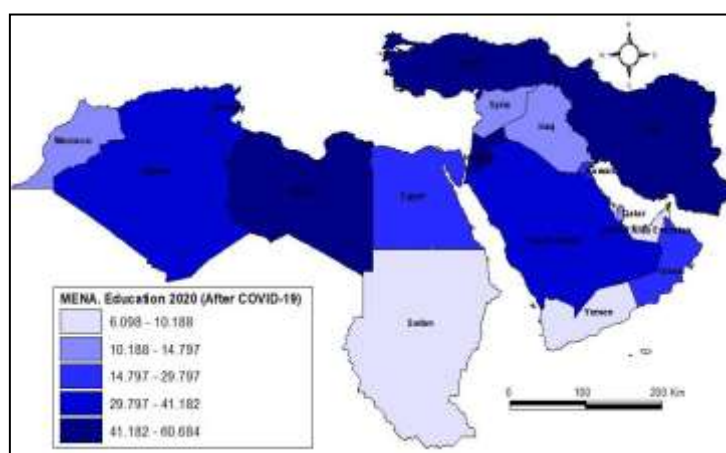
##### 4.1 Comparison between the two Education indicator situations (2017 and 2020)

**Figure 9: Education (2017)**



Source: Realized by the author

**Figure 10: Education (2020)**



Source: The author

<sup>1</sup>Mtiraoui, A. (2020) : “The effect of the epidemic between Malthus' perspective and the revival of economic growth for some countries in North Africa and the Middle East.” *hal: hal-02566944*

The governance of public spending, especially spending on the education sector, remains at the heart of controversy regarding national development policies. Indeed, in public administration, governance is the process by which "government run public resources." Public finance is the most important mechanism available to governments for the performance of their public policy objectives, good governance of public finances is therefore essential for the success of these public actions in MENA region (Figure 9 and 10)

Before the COVID-19 pandemic, education in the MENA region, particularly in countries such as Morocco, heavily relied on vocational training, qualifications, and on-the-job learning as primary mechanisms for investing in human capital. These forms of professional skills development are essential for enhancing labor productivity and fostering economic growth (World Bank, 2019; Mtiraoui, 2021). By qualifying human resources and strengthening human capital, these investments play a pivotal role in supporting both individual empowerment and broader economic development.

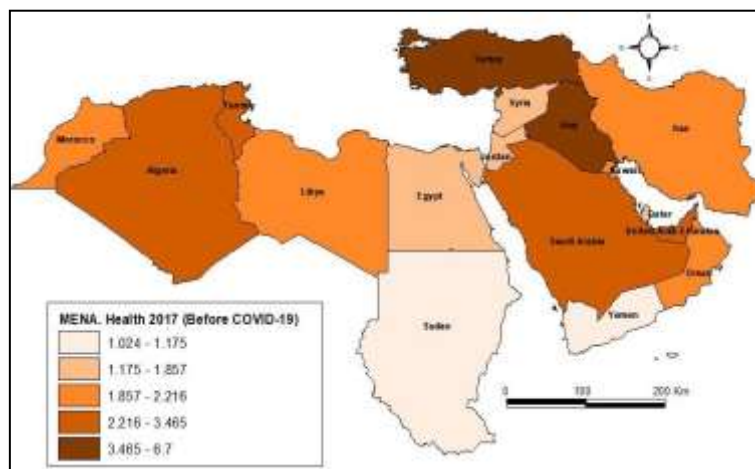
However, formal schooling remains the cornerstone of human capital investment. As noted by Psacharopoulos and Patrinos (2018), without widespread literacy and generalized education, vocational training tends to be selective and insufficient for fully integrating the working population into wealth creation. This is particularly critical in the MENA context, where educational disparities continue to limit inclusive development (UNESCO, 2020). Therefore, while vocational training and continuous learning contribute to skill acquisition, they cannot substitute for universal access to basic education and literacy.

During the COVID-19 pandemic, the MENA region faced significant challenges in education financing. Research indicates that the overall share of education spending was insufficient, leading to a negatively significant impact on human capital development (IMF, 2021). In contrast, investment in research and development (R&D) showed a positive and statistically significant effect on human capital indicators, highlighting the importance of R&D in improving education quality and reducing illiteracy rates (World Bank, 2020; Mtiraoui, 2021). Strengthening R&D investments can enhance educational innovation and adaptability, which are crucial for building resilient education systems in times of crisis (OECD, 2020).

Moreover, public expenditure granted to education and health services occupies a very important part in the totality of the expenses of the government which are insufficient to improve research and reduce the rate of ignorance (rate of illiteracy). The effect on growth is indirectly linked by the impact of human capital on growth because human capital explains the expenditure above. A major effect of economic growth on health is the extension of government control over the resources associated with growth (Mtiraoui, 2015).

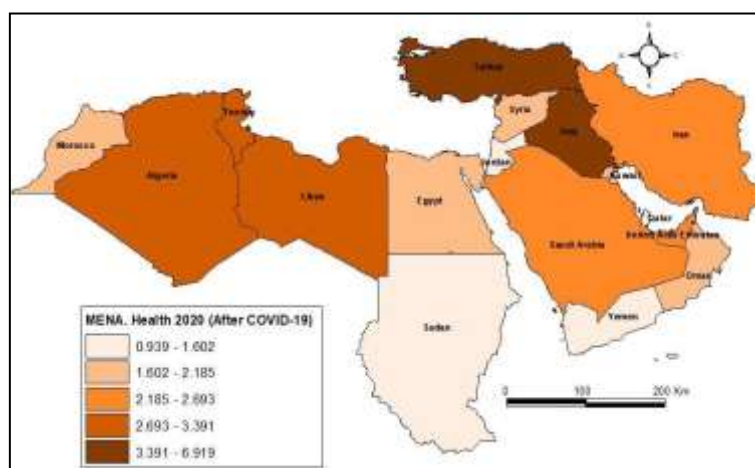
4.1. Comparison between the two Health indicator situations (2017 and 2020)

Figure 11: The Health (2017)



Source: Realized by the authors

Figure 12: The Health (2020)



Source: The author

The determinants of health expenditure are numerous and their respective impact difficult to separate (Figure 11 and 12). Before the COVID-19 pandemic, three fundamental factors have been identified as key drivers sustaining the upward momentum of public spending in the health sector over the long term:

*-Health developments:* Changes in the population’s health status directly influence the demand for healthcare services. Rajkumar and Swaroop (2002) highlight the critical role of governance in determining the effectiveness of public spending, arguing that improved governance can enhance health outcomes by ensuring that resources are efficiently allocated to meet evolving health needs. As population health improves or deteriorates, public spending must adjust accordingly to accommodate the changing demand for care.

*-Standard of living:* Economic growth and rising incomes lead to higher demand for healthcare services, as individuals seek better quality and more comprehensive care. This income elasticity of healthcare demand is well documented by authors such as Newhouse

(1992), who notes that as income increases, so does the consumption of health services, often disproportionately to other goods due to its essential nature.

*-Advancement of medical knowledge and technical progress:* The healthcare sector is characterized by rapid innovation, which frequently drives up costs. Unlike process innovations that reduce costs, many medical innovations tend to be product-based, introducing new and often expensive treatments and technologies (Cutler, 2004). This innovation-driven cost escalation is a key mechanism behind the long-term growth of health expenditure.

Furthermore, the structure of public health systems plays an essential role in cost containment. Integrated public systems, which offer coordinated care and centralized control over resource allocation (for example, through mechanisms like *numerus clausus* limits on medical practitioners), are traditionally more effective in controlling costs compared to fragmented or segmented systems (OECD, 2017). Such systems can implement global supply control instruments that help restrain unnecessary expenditure and improve efficiency. During the COVID-19 pandemic, public sectors across the MENA region faced unprecedented challenges. Governments were compelled to rapidly coordinate crisis management, enforce public health measures, and implement economic stimulus packages to support vulnerable households and businesses. The crisis tested the capacity and resilience of public administrations, revealing both strengths and areas requiring reform (World Bank, 2020). From an economic policy perspective, strong public governance is critical to ensure the continuity of essential services and maintain social stability during crises. This requires policies that enhance public sector adaptability, improve transparency, and rebuild trust in government institutions (Fukuyama, 2020). The pandemic has accelerated the urgency for comprehensive public administration reforms aimed at creating a more professional, efficient, and user-centered public sector capable of responding effectively to future shocks (OECD, 2021).

In summary, sustaining health sector spending over the long term depends on the interplay between demographic and economic drivers, technological innovation, and the design of public systems. Simultaneously, the COVID-19 crisis underscores the vital role of good governance and institutional resilience in crisis response and recovery.

## Conclusion

Looking ahead to the impact of COVID-19, analyzing how the pandemic affects the Middle East and North Africa (MENA) region, Arezki and Nguyen (2020) highlight several key channels through which the crisis has unfolded:

To overcome the post-COVID-19 challenges identified in the MENA region, policymakers should prioritize economic diversification by reducing reliance on oil through targeted investments in sectors like manufacturing, renewable energy, and digital services, guided by spatial analysis to focus on vulnerable regions. Enhancing regional trade facilitation by streamlining customs, improving infrastructure, and harmonizing regulations along key trade corridors can restore disrupted supply chains and boost resilience.

Supporting the severely impacted tourism sector through domestic and regional promotion, infrastructure upgrades, and health safety initiatives is crucial, with spatial data helping to allocate resources effectively. Expanding access to finance, especially for SMEs and

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underserved areas identified via spatial mapping, will strengthen economic recovery. Accelerating digital infrastructure development and adopting policies that facilitate digital trade and e-commerce will bridge digital divides and attract foreign direct investment in services. Additionally, improving regulatory frameworks and fostering regional cooperation, particularly regarding labor mobility and investment rules, will enhance the region's competitiveness.

The Spatial data analysis using ArcGIS Pro can help visualize the tourism decline by mapping the areas most impacted by restrictions and highlighting regions where tourism is a critical sector. This information can guide targeted economic recovery strategies, focusing on promoting local tourism and alternative economic sectors. ArcGIS Pro can assist in analyzing regional trade patterns, identifying key trade corridors, and assessing the potential for increased trade facilitation across the region. Improved logistics and trade facilitation are essential for restoring supply chains and ensuring smoother regional trade flows.

Mapping the infrastructure and trade routes that have been affected by the pandemic can help policymakers prioritize investments in these areas. To stimulate economic recovery, it is crucial to improve access to finance and implement regulatory reforms, particularly in the trade of services. ArcGIS Pro can be used to map regions with limited access to financial resources and evaluate the effectiveness of government interventions aimed at improving financial access. Spatial analysis can also identify the areas most in need of regulatory changes to improve cross-border trade in services, helping to guide future trade agreements and policies. The transition to greater facilitation of digital trade should be a priority in future trade agreements. ArcGIS Pro can map the digital infrastructure and internet access across MENA countries, identifying regions that are well-equipped to facilitate digital trade and those that may require further investment in digital infrastructure.

Policymakers can use this information to focus on bridging digital divides and ensuring that all regions benefit from the shift towards e-commerce and digital services. To attract FDI linked to trade in services, MENA countries must rethink the rules governing the temporary movement of people and be more open to regional cooperation. Using ArcGIS Pro, spatial analysis can be conducted to determine which MENA countries are more attractive to FDI in services, based on factors like infrastructure, market access, and regulatory environment. This can guide policy reforms to make the region more competitive in attracting international investment.

Finally, embedding data-driven decision-making through ongoing spatial analysis tools like ArcGIS Pro within public institutions will enable responsive and evidence-based policy interventions, ensuring a more resilient, inclusive, and diversified post-pandemic economy across the MENA region. The COVID-19 pandemic has had far-reaching implications for the MENA region, affecting trade, tourism, oil revenues, and economic growth.

Using ArcGIS Pro to analyze spatial data on trade, tourism, and economic performance can help policymakers make informed decisions about where to focus recovery efforts, identify sectors most affected by the crisis, and implement targeted policy reforms. By improving trade facilitation, digital infrastructure, and access to finance, and by rethinking regulatory frameworks, MENA countries can set the stage for a more resilient and diversified post-pandemic economy.

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