

# Trade Openness and Regional Inequality: Case of Tunisia

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## ABSTRACT

Since the 1990s, Tunisia has experienced an increasingly pronounced trade openness and has adopted a multitude of reforms to reinforce it through a large number of agreements with different foreign partners. However, this openness has gone simultaneously with an increase in regional inequalities which have continued to grow, that is why we are interested in verifying, on one side, how this openness affects economic growth and, on the other one, whether it increases regional disparities within the country over the period (1990-2018). We start from the hypothesis that if trade openness manages to boost economic growth, its positive outcomes can have a contrasting effect at the regional level, benefiting some regions to the detriment of others. By crossing this double effect openness can accentuate territorial imbalances. We will use panel data econometrics to estimate our model. We will test the effect of openness on territorial disparities for the Tunisian case, especially between the 24 governorates where, there is no measure of regional inequalities yet, hence the interest of this study. Our econometric analysis clearly shows that the differences in endowments and characteristics at the level of the regions, such as differences in infrastructure or human capital, positively affect regional inequalities. Openness also appears to be a factor of positive influence, in particular by enhancing the polarization of economic activities and FDI within certain regions to the detriment of others.

**Keywords:** Panel Data, Regional Inequality, Trade Openness, Tunisia.

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## I. INTRODUCTION

In recent years, most countries have experienced a growing openness to foreign trade, which has raised many questions about its effects on growth and inequalities. It should be noted that despite the convergence of a large number of countries, there has been an unprecedented rise in inequalities, especially within the developing countries.

These inequalities are not only social but also regional. It must be emphasized that the coastal regions are always better endowed with innovative activities and qualified human capital, while interior regions benefit from considerably fewer privileges.

Daumal and Ozyurt (2010), when examining the question for the Brazilian case, showed that wealthier regions benefited the most from trade openness, while poorer regions had to resort to traditional activities, particularly agriculture.

Other studies that have looked at the effect of FDI, such as Ge (2009), showed that despite the positive effect of FDI on growth, it does not prevent them from accentuating the phenomenon of agglomeration and concentration within certain regions, causing territorial imbalances.

The dilemma today at the international level is to learn how to take advantage of the gains that trade opening can bring while limiting its effects on regional disparities. Developing countries seem to be the perfect example to illustrate this situation.

Tunisia is no exception to the rule, a country with geographical advantages that have reinforced its openness to the outside world, supported by a large number of economic reforms and international conventions. However, years after the country began its liberalization process, regional disparities remain persistent, creating a significant imbalance in the Tunisian territory, due in particular to a significant gap between the coastal and the interior regions, in terms of infrastructure development, growth, unemployment rates, poverty, and the distribution of economic activities. This leads to a large socio-economic imbalance, with the coastal regions enjoying the full advantage of their proximity to foreign markets and a fairly well-developed infrastructure, while the interior regions are limited to traditional activities such as agriculture characterized by lower added value.

Nowadays, the issue of regional inequalities is a major concern, as well as a priority and a political issue. Indeed, it directly affects social cohesion and peace, especially in the current context of Tunisia, a country in a democratic transition phase, and a post-revolutionary period. It is important to note that regional disparities are a major cause of the popular revolt and which remain relevant today.

Hence the question, how could trade openness influence regional inequalities?

We will therefore address the regional dimension of the disparities affecting the country and provide an empirical contribution.

## II. TRADE OPENNESS AND REGIONAL INEQUALITIES

For a long time, international trade has been perceived as an important catalyst for economic growth, a fact that has been true in developed countries and is now affirming itself in a great number of developing countries, causing the catch-up of many of them.

Thus, the promotion of foreign trade and greater international integration are considered major objectives in a large number of countries. The question of the inequalities they may generate has been for a long time relegated to the background.

A 2009 World Bank report entitled "Reshaping economic geography" further supports the importance of foreign trade in promoting economic growth, while asserting that its effects on inequality will only be felt in the short term, since in the long run inequality will be mitigated by the development and growth generated by this trade openness.

On the other hand, the studies that have focused on this issue have concentrated much more on the wage aspect of inequalities and not the regional one.

It is only in recent years that we have seen the emergence of a significant number of studies that have addressed the issue of regional inequalities.

Thus, several models and empirical analyses have been developed to study the interactions between external openness and regional inequalities, particularly concerning the spatial distribution of economic activities within a single country.

Krugman and Elizondo (1996) developed a theoretical model for Mexico based on the existence of congestion costs as a centrifugal force, they were able to conclude that the opening up was followed by a decrease in spatial disparities, in particular through the decrease of the central urban region's primacy.

This finding is also confirmed by Moomaw and Shatter (1996), who concludes that metropolitan concentration has been declining since the opening up of the economy, in particular, because of the increase in exports, which makes the large cities less important.

Gelan (2003), for his part, found that by including export costs the trend was reversed and that the latter could cancel out this centrifugal effect.

Paluzie (2001), by adopting the same model but retaining the existence of an immobile labor force instead of congestion costs, comes to contradictory conclusions, namely that openness increases the polarization and concentration of economic activities in a single region, conclusions also confirmed by Monfort and Nicolini (2000).

In another study, Paluzie *et al.* (2001), who examined the case of several Spanish regions over different sub-periods, found a positive correlation between foreign trade and the concentration effect, but this link tended to decline, especially from the 1970s onwards, as a result of increasingly pronounced European integration.

These conclusions are also supported by Lanaspá *et al.* (2003), who, by analyzing 100 Spanish cities, conclude that there has been a decrease in concentration due to a decline in the primacy of large cities and the development of more and more intermediate's ones.

For Shantong and Fan (2002), considering the China case, the openness impact on spatial distribution remains relatively weak, due in a large part to the importance of assembling trade, this relationship depends much more on the migratory flux of the workforce.

### A. The Impact of the Geographic Location

The emergence of the new geographic economy has led to the appearance of a good number of works and analyses that have focused on the effect of trade openness in relation to spatial distribution, particularly between two regions, namely the central region and the peripheral one, while taking into consideration a number of factors in this relationship.

Henderson (1997), states that the trade openness effect on spatial distribution depends largely on geographical location. Indeed, Hanson (1998) demonstrates that the increase in foreign trade encourages firms to establish themselves in regions with the best access to foreign markets, an observation confirmed by Henderson and Kuncoro (1996), in their analysis of Indonesian firms.

Henderson (2002), later confirmed these findings empirically, deducing a negative correlation between openness and concentration, particularly through the development of peripheral regions, which are generally distinguished by better access to foreign markets. However, this trend may be reversed if the central region, which already has the main economic activities, is also endowed with a port, which would favor it even more to the detriment of the other regions.

In the same vein, Venables (2000), states that distance is a major factor in explaining inequalities, which creates additional costs.

Indeed, a peripheral region separated by a certain distance from the main markets must pay the cost of its remoteness, which further accentuates the disparities between regions.

Crozets and Koenig-Soubeyran (2002), looking at the case of Romania, also find that following its accession to the European Union, the country has seen the emergence of agglomeration effects in regions close to foreign markets.

Sanchez-Reaza and Rodriguez pose (2002; 2003), Faber (2007), Jordaan (2008), and Ford *et al.* (2009) focusing on the case of Mexico, have concluded that the intensification of economic integration, particularly following the NAFTA (North American Free Trade Agreement) has led to a highly differentiated distribution between the interior of the country and the border regions, with the latter benefiting much more.

For Pose (2012), external openness in combination with certain factors such as the existence of large inter-regional differences in development, or in the amount of public expenditure granted, as well as in the geographical location, particularly with regard to foreign markets, can accentuate the effects of polarization, and he adds that these effects are even more pronounced for low- and middle-income countries.

### B. Role and Nature of the Infrastructure

For several authors, the geographical distribution of economic activities within a country may depend to a large degree on the nature of the infrastructure. (Catin & Ghio, 2000).

Indeed, the latter can act through two channels, on the one hand by reducing transaction costs such as transport costs (Ghio & Van Huffel, 1999). On the other hand, it can be done

by reducing the costs linked to the production process itself (Charlot 1999).

In the same context, Martin and Rogers (1994), argue that transport costs are a decreasing function of the infrastructure development level.

Henderson (2000) suggests that increasing the road network density will mitigate the concentration effect in the central regions.

The conclusions of Ades and Glaeser (1995) are in the same vein. Their analysis shows that a 1% increase in public expenditure on improving transport and communication services reduces the polarization of large cities by 10%.

As for Behrens (2003), a more pronounced integration, especially with regard to developing countries characterized for the most part by a relatively undeveloped infrastructure, will give even more primacy to large cities, accentuating the concentration effect.

Daumal and Ozyurt (2010), looking at the case of Brazil, have shown that trade openness has always gone in favor of regions with the most developed infrastructure and favorable geographic location, pushing the less advantaged ones toward more traditional activities such as agriculture.

Similarly, Daumal (2013), in another study that looked at the impact of openness on regional inequalities in Brazil and India, concluded that openness had led to greater inequalities between regions, with increasingly rich regions, especially in the South, and increasingly poor ones in the North.

### C. Role of FDI

It must also be emphasized that the openness effect can be largely influenced by the public policies put in place. Indeed, public authorities can often play a role in aggravating inequalities between regions by carrying out geographically targeted actions that favor certain regions to the detriment of others. This phenomenon has been particularly seen in China, where special economic zones (SEZ), especially coastal cities, have been given preferential treatment in order to attract foreign investors, leading them to have significantly higher growth rates than other regions. Jones and Cheng (2003), in their analysis of 200 Chinese cities' growth, were able to prove that these SEZs had an average growth rate of 5% higher.

From this perspective, it is essential to take into account the role of FDI, which is nowadays a major part of contemporary foreign trade.

The latter do not escape the accusation of having generated inequalities.

Ge (2008) has shown that despite the positive effect of FDI on growth, it does not prevent them from accentuating the phenomenon of agglomeration and concentration within certain regions, thus causing territorial imbalances.

Thus, Hsu and Liu (2004), looking at the Chinese case, were able to conclude that trade openness had a positive influence on inequality, particularly through FDI, and that this impact tends to intensify over time.

Feenstra and Hanson (1997), have shown, for the case of Mexico, that the increase in FDI is positively correlated with a significant growth in the demand for labor, and this effect is much more pronounced in the regions bordering the United States, where 50% of the rise in labor wages is explained by the influx of FDI.

This trend has led to an increased mobility of the workforce in developing countries over the years, as well as significant resources to the regions where FDI is concentrated, i.e. the coastal and central regions, making it even more difficult for the regions in the interior to catch up. These regions are being forced to turn to more traditional activities, mostly agricultural, thereby aggravating territorial inequalities.

In the end, the various theoretical models and empirical studies, although based on different assumptions, agree that trade openness can significantly influence regional disparities.

However, these different analyses have resulted in mostly divergent conclusions that do not lead to a general consensus.

It appears that this relationship depends on a large number of influencing factors, such as the public policies put in place, the process of opening up itself, as well as the specific characteristics of the regions, such as the geographical situation or the development level, particularly that of the infrastructure.

However, several authors who have focused on this topic, such as Chai (1996), Kanbur and Zhang (1999), Jones and Cheng (2003), Fu (2004), Catin and Van Huffel (2004), Gonzalez Rivas (2007), Ge (2008), Daumal and Ozyurt (2010), Fajgelbaum and Redding (2014), Brulhart *et al.* (2015), Ali Najeh (2015) or Jan Bakker (2019), agreed on the fact that regions with a concentration of innovative activities and a skilled workforce, often located on the coast, especially where FDI is concentrated, take full advantage of their proximity to the sea, which is synonymous with lower transport costs, faster goods and transactions delivery and therefore a greater openness to the outside world.

## III. EMPIRICAL VALIDATION

### A. Model Specification

We focus on the effects of trade openness on regional inequalities in Tunisia, particularly between the different governorates of the country.

Our estimation will therefore cover the 24 Tunisian governorates.

Indeed, we start from the statement that trade openness participates largely to stimulate economic growth, however the fallout does not seem to reach and affect the different regions in the same way, having a contrasting effect on their development and being likely to increase the inequalities already well established in the territory.

The stylized facts clearly show that several factors have a positive impact on economic growth, especially at the regional level, such as openness to foreign trade, infrastructure development and human capital accumulation. However, what we can clearly see is that inequalities continue to grow at the regional level, with coastal regions monopolizing economic activity and benefiting from better integration into foreign trade, while inland regions are relegated to the background.

Our model will also be inspired by the solow's (1957) growth model as well as different works such as those of Jones and Cheng (2003), Rivas (2007) and Daumal and Ozyurt (2009). It will therefore take the form of (1).

$$LRGDP_{it} = \alpha_0 + \alpha_1 LFDI_{it} + \alpha_2 LWATER_{it} + \alpha_3 LELEC_{it} + \alpha_4 LSAN_{it} + \alpha_5 LCENT_{it} + \alpha_6 LEDU_{it} + \alpha_7 FTA_{it} + \varepsilon_{it} \quad (1)$$

At this level, it should be mentioned that one of the major concerns we have faced is that the Tunisian statistical database does not provide us with the regional GDP, which has led us to approximate it by the consumption of high and medium-voltage electricity in million (Kw/h). The point is that greater economic productivity will imply a higher consumption of high and medium-voltage electricity.

**B. Variable Definitions**

Table I lists the different variables used in our econometric model and their definitions.

TABLE I: VARIABLE DEFINITIONS

Variable	Definitions
RGDP	Regional GDP
FDI	FDI per governorate
WATER	Water supply per governorate
ELEC	Connection to electricity per governorate
SAN	Connection to the sewerage system per governorate
CENT	Number of health care facilities per governorate
EDU	School enrolment rate per governorate
FTA	Free Trade Agreement per governorate

Source: All our data come from the National Institute of Statistics, the World Bank, the Foreign Investment Promotion Agency, the Tunisian Electricity and Gas Company and the Fraser institute.

**C. Methodology**

We will use panel data econometrics to estimate our model.

However, our different specification tests have shown that our model suffers from two major problems, namely an autocorrelation of the errors as well as heteroscedasticity that can bias our results.

This leads us to use the FGLS method, developed by Parks (1967), which is a generalization of the ordinary least squares estimator, it proves to be particularly effective in handling the problem of heteroscedasticity and autocorrelation of errors.

We then divided our study period into two sub-periods, one before the signing of the free trade agreement and one after, in order to better assess the effect of trade openness on regional inequalities.

However, in this particular case Beck and Katz (1995), demonstrated that the FGLS estimator loses its effectiveness in the presence of a sample with a number of individuals (N) greater than the number of periods (T), and proposed the PSCE estimator (corrected standard error panel), which proves to be more effective in this specific case.

TABLE IV: CORRELATION MATRIX

	ELEC	SAN	WATER	CENT	FDI	EDU	DENS	FTA	GOV	DIS	FDI*FTA
ELEC	1.0000	-	-	-	-	-	-	-	-	-	-
SAN	0.2444	1.0000	-	-	-	-	-	-	-	-	-
WATER	0.6478	0.1643	1.0000	-	-	-	-	-	-	-	-
CENT	0.0404	-0.1242	-0.3830	1.0000	-	-	-	-	-	-	-
FDI	0.1623	0.2917	0.3242	-0.1793	1.0000	-	-	-	-	-	-
EDU	0.2383	0.1501	0.2164	0.3868	0.5081	1.0000	-	-	-	-	-
DENS	0.1635	0.2909	0.3616	-0.3261	0.8066	0.5997	1.0000	-	-	-	-
FTA	0.4014	0.3816	0.2791	0.0995	0.2172	-0.0307	0.0408	1.0000	-	-	-
GOV	0.6473	0.4632	0.3405	0.1716	0.2017	0.1194	0.0441	0.7830	1.0000	-	-
DIS	-0.2168	-0.0078	-0.5009	0.0563	-0.2787	-0.4701	-0.3223	-0.0111	-0.0092	1.0000	-
FDI*FTA	0.1356	0.2495	0.2577	-0.1332	0.9484	0.3636	0.6280	0.3126	0.2481	-0.2071	1.0000

Source: Author's calculation based on STATA

**D. Diagnostic Tests**

This step aims to confirm our estimated model validity, via a number of tests such as the autocorrelation test, the heteroscedasticity test and finally the normality test.

Table II reports the results of the different tests, which confirm that our model suffers from two major problems, namely error autocorrelation and heteroscedasticity.

TABLE II: DIAGNOSTIC TESTS

Wooldridge test for autocorrelation	
Chi2	Prob chi2
19.615	0.0002
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	
Chi2	Prob chi2
16.90	0.0000
Jarque-Bera normality test	
Chi2	Prob chi2
2.909	0.2335

Source: Author's calculation based on STATA

**E. Estimation**

In this section, we will proceed to our model estimation while reporting at each step the main results.

**1) Descriptive statistics**

Table III reproduces the descriptive statistics reporting indicators of position, dispersion and form in order to check the symmetry, dispersion and precision of the information provided by the variables used in our model.

TABLE III: DESCRIPTIVE STATISTICS

Variables	N	mean	sd	min	max
PIBR	600	2.192	0.869	0.800	4
ELEC	600	0.932	0.194	0	0.999
SAN	600	0.730	0.220	0.0740	0.996
WATER	600	0.795	0.177	0.289	0.999
CENT	600	84.04	32.29	21	157
FDI	577	320.6	896.9	2	8,368
EDU	570	38,890	18,469	7,741	98,036
DENS	600	310.2	695.2	3.477	3,718
FTA	600	0.440	0.497	0	1
DIS	600	73.88	67.77	4	210
GOV	600	0.829	0.0486	0.731	0.888

Source: Author's calculation based on STATA

**2) Correlation matrix**

Table IV represents the correlation matrix between our different explanatory variables. We notice a strong correlation between FDI and DENS, which led us to use separate estimations where we included each of these variables separately. Concerning the other variables the correlation coefficient is well below 0.8, which is the limit set by Kennedy (2008).

TABLE V: ESTIMATION RESULTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	LRGDP	LRGDP	LRGDP	LRGDP	LRGDP	LRGDP	LRGDP
LFDI	0.135*** (0.00823)	0.123*** (0.00908)	-	-	0.116*** (0.00902)	0.0837*** (0.0159)	0.112*** (0.0152)
LWATER	0.300*** (0.0633)	0.312*** (0.0623)	0.370*** (0.0594)	0.356*** (0.0600)	0.434*** (0.0550)	0.337*** (0.0745)	0.398*** (0.0870)
LELEC	0.567*** (0.115)	0.521*** (0.112)	0.706*** (0.106)	0.736*** (0.108)	0.466*** (0.0949)	0.468*** (0.100)	5.764*** (1.134)
LEDU	-0.0332 (0.0250)	-0.0132 (0.0264)	-0.105*** (0.0277)	-0.108*** (0.0271)	-0.0290 (0.0225)	0.0578 (0.0374)	-0.282*** (0.0678)
LSAN	0.333*** (0.0270)	0.321*** (0.0262)	0.300*** (0.0245)	0.310*** (0.0251)	0.292*** (0.0236)	0.267*** (0.0289)	0.110 (0.115)
LCENT	0.0702*** (0.0262)	0.0785*** (0.0274)	0.113*** (0.0322)	0.104*** (0.0316)	0.0465** (0.0229)	0.0618** (0.0285)	0.216** (0.0913)
FTA	-	0.0103*** (0.00371)	0.0127*** (0.00378)	-	0.0133*** (0.00308)	-	-
LDENS	-	-	0.753*** (0.0546)	0.755*** (0.0590)	-	-	-
FDI*FTA	-	-	-	0.00428*** (0.00153)	-	-	-
LDIST	-	-	-	-	-1.49e-11 (2.01e-11)	-0.0356 (0.144)	-1.28e-10* (6.53e-11)
GOV	-	-	-	-	0.331*** (0.101)	-	-
Constant	0.232** (0.116)	0.154 (0.119)	-1.380*** (0.149)	-1.355*** (0.157)	0.305*** (0.115)	-0.116 (0.155)	1.356*** (0.382)
Observations	576	576	576	576	576	336	240
R-squared	-	-	-	-	-	0.958	0.993
Numb of regions	24	24	24	24	24	24	24

Notes: Standard errors are in parentheses, P values: significance \*10%; \*\*5%; \*\*\*1%.

Source: Author's calculation based on STATA

### 3) Estimation results

We first estimated our model using the FGLS method, as illustrated in column (1) of Table V.

It is also worth mentioning that throughout our estimations we have progressively introduced variables such as distance, the free trade agreement with the European Union, the country's main trading partner, or institutional quality to see the influence that these variables may have on regional inequalities alongside the effects of the initial explanatory variables of our basic model.

Column (2) presents the estimation where we added the FTA dummy variable representative of the free trade agreement with the EU, a variable that takes the value of 0 between 1994 and 2007 and 1 between 2008 and 2018, allowing us to capture the effect of this agreement that presents itself as an additional variable representative of trade openness.

Column (3) represents the regression where we introduced the population density variable (DENS) at the regional level. Indeed, the latter was found to be strongly correlated with the regional FDI variable, so we considered the effect of each of the two variables separately.

However, we then added to the regression presented in column (4) an interactive variable between FDI and the FTA variable (FDI\*FTA), which are the two variables representing trade openness, this variable is not correlated with the population density.

Finally, in column (5) we introduced the distance variable (DIS), which is a spatial indicator, informing us about the distance separating the governorates from the nearest ports.

We will also add the governance variable to capture the effect of institutional quality.

We then divided our estimation period into two sub-periods, one before the FTA between 1994 and 2007 and another between 2008 and 2018, to better capture the effect of the dismantling of tariff barriers and to see how the significance of our variables evolves following greater openness, allowing us to have a better appreciation of the phenomenon.

For these last two regressions, we used the PCSE method, the results are presented in columns (6) and (7).

### 4) Findings interpretation

We can see that following our different estimations, the majority of our explanatory variables proved to be significant.

Thus, we note that the variables related to foreign trade openness, whether it is the variable representing FDI by governorate or the one related to the free trade agreement with the EU, proved to be statistically significant at the 1% threshold in all our regressions and exerted a positive effect on regional GDP, confirming once again the importance of the effect of openness to foreign trade on regional growth.

Indeed, the FDI variable which proved to be highly significant and positively affecting the regional GDP, becomes nevertheless more significant following the entry into force of the FTA. This clearly shows the important role that FDI plays at the level of growth and regional development, proving to be an excellent channel of new technologies, knowledge, and innovations' transmission, contributing in this way to the development and qualification of the labor force with a highly diversified presence in multiple sectors. On the other hand, they are an effective means of absorbing the work request. The Tunisian foreign investment promotion agency reports that the offshore non-energy sector has created in 2018 more than 11,469 jobs or

83.2% of the total number of jobs created. However, FDI is still concentrated mainly in the coastal regions, thus contributing to the widening of the gap between the coastal regions and the interior regions, which only collect less than 10%.

Indeed, Tunisia has for a long time pursued a growth policy strongly focused on attracting FDI by appealing, for example, to a code of incentives for investment, particularly foreign investment, which contributes to better economic growth in the host regions. However, foreign investments are concentrated in certain regions to the detriment of others, namely the coastal regions which already have a considerable development lead. This contributes to further aggravating the situation concerning regional imbalances from which the country has already been suffering for several decades.

The variables relating to the convenience of life such as the number of health care centers per governorate or the variables relating to the development of the infrastructure such as the connection to the electric current, the sewerage network, or drinking water, all these variables have a positive and statistically significant effect at the threshold of 1% in the major part of our estimates supporting, even more, the thesis in favor of the importance of the infrastructure's development concerning the regional growth.

These results lead us to focus on the concentration of FDI in certain regions, particularly coastal ones which enjoy a developed infrastructure that attracts FDI. Indeed, our estimates clearly show that the different variables representing infrastructure are statistically significant and have a positive effect on regional growth, which facilitates the insertion of these regions into world trade via the attraction of FDI and the facilitation of its establishment, but also via the attraction of human capital due to better living facilities and better opportunities at the professional level.

Heo and Oh (2015), by studying the case of South Korea, have shown that trade openness has gone much more in favor of regions with the most developed infrastructure.

The positive effect of infrastructure variables in all our regressions confirms its weight. This further emphasizes the importance of public investment in regional development and growth. Although it must be noted that Tunisia has a long history of ill development, which has always favored the capital and the coastal areas, resulting in serious territorial imbalances that have persisted for many years and have repeatedly affected social cohesion.

On this point, Ali Najeh (2015) was able to demonstrate for the Tunisian case that the initial endowments, as well as the geographical position, largely explained the regional disparities and divergences, showing also that following the opening up, growth, development, and reduction of poverty were observed more at the level of the coastal regions.

Farole (2013) also added in a study of 28 low and middle-income countries in East and central Asia, Europe, and Latin America that the increase in regional inequalities following trade opening was more noticeable in countries that already had significant inter-regional differences with minimal government intervention and low public expenditure at the regional level.

In fact, programs for more regional development to help interior regions will be beneficial for the latter, which are

often disadvantaged, thus improving their capacity to host multinational firms.

As for the variables relating to human capital, the effect of population density by governorate is statically significant at the 1% threshold and has a positive effect on regional GDP. In the Tunisian case, the exodus of the population from the interior regions to the coastal regions and the capital only accentuates the gap between the two groups of regions, which is already well established.

Our results are also in line with those of Baylis *et al.* (2009) stating that the most populated regions grew more than the others following the opening of trade and benefited from a greater productive force.

For their part, Daumal and Ozyurt (2011) also concluded that opening up to foreign trade benefited regions with stronger human capital that are more likely to adopt economic activities, especially in new technologies.

This supports the results of multiple studies that have already addressed this issue, such as Nelson and Phelps (1966), Benhabib and Spiegel (1994), and Connolly (2003), which defend the thesis of the complementarity between trade openness, technology, and the accumulation of human capital.

Fajgelbaum and Redding (2014) have also shown that more pronounced trade openness leads to an increase in population density, especially in regions with endowments that give them easier access to foreign trade, notably coastal regions.

On the other hand, we find that the education rate variable was both significant and insignificant in our estimates, unlike the other variables, its effect on regional GDP was negative, especially following the entry into force of the FTA. This counterintuitive effect further testifies to the situation in Tunisia, which is characterized by disconnection and an inadequacy between the labor market and the educational system with a rather difficult insertion of young graduates in the professional sphere. Young graduates suffer the most from unemployment with a rate that is twice higher than the national average. It should also be noted that following the opening up of the economy, the job market demand favored unskilled work. The figures put forward by the Tunisian statistical agency will also confirm this observation.

Certain studies such as Barro and Lee (1994), Pritchett (2001), Sala-I-Martin (2002) and Krueger and Lindahl (2001) have already highlighted this negative effect of the schooling rate.

Subsequently, Heo and Oh (2015), focusing on the South Korean case, demonstrated that trade openness was much more beneficial to individuals with low levels of education through job creation, which targeted unskilled work.

The effect of the distance variable was negative and significant at the 1% threshold. It has a negative effect on regional GDP.

Indeed, the various costs generated by the distance factor have a great influence on the location of economic activities and especially concerning FDI. This generates a differentiated distribution at the regional level, which can be noted at the level of the Tunisian cartography with the Eastern regions monopolizing the majority of the economic activity, benefiting from their advantageous geographical situation, and presenting better access to the principal foreign markets.

In the same context, Venables (2000) has confirmed that distance can be a factor in explaining regional disparities.

Hanson (1997) has shown that the acceleration of international trade encourages firms to settle in regions with more advantageous geographical situations and with better access to ports and therefore to foreign markets.

As for Henderson and Kuncoro (1996), by focusing their analysis on Indonesian firms, they were able to show that the latter preferred the coastal cities with the largest ports to those in the interior because of the importance of the costs generated by the distance.

Finally, the effect of the governance variable was found to be positive and significant at the 1% level, as institutional quality positively affects regional GDP. For Acemoglu *et al.* (2005), institutional quality is an important factor in economic performance. The good functioning of the market is largely conditioned by the quality of institutions. In the context of market activities involving a good number of agents and institutions, the role of good governance is to reduce information asymmetries, and various risks by ensuring the respect of rights and clarifying the responsibilities and limits of action for each party.

However, Tunisia has a lot of efforts to make and a long way to go in this area, as it is relegated to the bottom of the international ranking, according to the Fraser institute's economic freedom report 2022, Tunisia occupied in 2018, the 128th place out of 162 countries, and is therefore ranked in the last quartile.

Our results, therefore, confirm the conclusions put forward by a great number of studies that have focused on the issue of regional inequalities, such as Domecq and Regnault (1990), Figlio and Blonigen (2000), Métral (2003), and Mullen and Williams (2005). Who has shown that the opening up of regions to FDI accentuates the concentration of economic activities in certain regions to the detriment of others? For authors such as El Bekri (2000), this is linked to various factors such as the development of the infrastructure, the ease of access or the local potential, particularly in terms of human capital.

Other studies have subsequently confirmed these findings, such as that of Karray and Driss (2009), particularly for the Tunisian case, for which FDI had a positive effect on job creation, productivity, and subsequently regional growth. However, this effect was more noticeable in the coastal regions where FDI was concentrated. Findings also confirmed by Fazekas (2005) for the case of Central Europe, namely that FDI only accentuated the phenomenon of geographical concentration, especially in the host regions, while leading to an increase in wages in the latter, thus further fueling regional inequalities. Bakker (2019) when studying the case of developed countries also subsequently confirmed this point.

#### IV. CONCLUSION

In this research work, we are interested in the links that may exist between growth, openness and inequality.

At the regional level, the indicators clearly show inequality and imbalance between the different regions, as the coastal regions benefit from significant participation in the economic

dynamics of the country and an increasing integration into the global economy and are the first to benefit from the positive spillovers, while the interior regions are mostly relegated to the background.

The indicators also show a clear difference in development in terms of infrastructure, education, health, and wealth.

Our econometric analysis shows that, on the one hand, the opening up of regions to FDI leads to an increase in regional inequalities, as FDI is mainly concentrated in coastal regions, which can only worsen the situation regarding spatial imbalance.

On the other hand, development of the regions is crucial to fight against inequalities. Our results also show that the persistent and flagrant differences in the infrastructures' development strongly hinder the interior regions while accentuating regional inequalities. The improvement of the infrastructure in the latter regions will allow them to catch up because, as we can see, the coastal regions benefit fully from the development of their infrastructure and their geographical situation which has led them to group nearly 90% of foreign companies. This is also evidenced by the increase in the rate of polarization from 49.9% in 2000 to 62.5% in 2010, thus accentuating the feeling of having been sidelined in several regions, particularly those in the interior.

Our econometric analysis also shows that on one hand, the opening of regions to FDI could boost economic growth at the regional level, but on the other hand, the concentration of FDI in certain regions can only worsen the situation concerning the spatial imbalances from which the country is already suffering.

In the end, we can conclude that trade openness has largely contributed to the deterioration of the situation concerning regional disparities, with free trade agreements that have mainly benefited the coastal regions. According to the national business directory, coastal regions account for approximately 90% of FDI. They are considered today as political and economic command centers, while western and southern regions have been marginalized and receive only 10% of FDI with a very unequal creation of wealth that does not seem to reach them. These regions are at the top of the rankings in terms of extreme poverty, illiteracy and unemployment rates.

Our study has shown that Tunisia suffers from regional inequalities with very differentiated findings in terms of productivity, development, or life quality, thus affecting the socio-economic situation and creating a major divide between the east and west of the country or between rural and urban areas. Indeed, the State has favored for decades a development model that has largely favored the coastal regions with an agglomeration of industrial activities including those with high added value in addition to a centralization of administrative and political decisions. On their side, the interior regions are most often obliged to rely mainly on agricultural activities facing an increasingly precarity, a minimal job creation, as well as a population being tempted by the exodus to the littoral looking for better living conditions.

Indeed, the Tunisian state has for a long time relegated the issue of regional equality in favor of economic propulsion. However, the interregional disparities that plague the country have created a real divide in the Tunisian territory and

profoundly affected cohesion and social peace, as evidenced by the events of 2011 and the various protest movements that followed.

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#### CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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