



# Exploring the Relationship Between Micro-Enterprises and Regional Development: Evidence from Tunisia

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**Abstract.** We investigate the relationship between the presence of micro-enterprises and regional development, as measured by a validated index of regional development, at the level of Tunisian *delegations* (small-scaled regions). Applying spatial measures and spatial econometric techniques on a data set of 262 delegations, our results show that in disadvantaged areas, a higher micro-enterprise presence is positively related to regional development. However, in relatively higher developed areas of Tunisia, micro-enterprises appear to play only a marginal role in regional development. In general, our results emphasise the importance of attracting large, capital-intensive firms in efficiency-driven economies like Tunisia. Our results also show the important and positive role that micro-enterprises can play in regions where large, capital-intensive firms are absent.

**Keywords:** Micro-enterprises, Tunisia, regional development, spatial autocorrelation, spatial heterogeneity.

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## 1. Introduction

For decades, Tunisia has been regarded as one of the best performing countries in Africa, not only in terms of macroeconomic performance but also in terms of

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social accomplishments (OECD, 2015). By means of its strategic plan, Tunisia has given the world an image of stability in the fields of macroeconomics and national development. Tunisia follows a strategy based on encouraging the creation of micro-enterprises as driver of the development process of the country. The *Learning Initiative for Entrepreneurship* program of the Agency of Promotion of Industry and Innovation (APII) is one of the programs launched by the State to support entrepreneurs, especially young graduates, to launch their micro-enterprise (APII, 2016). The advantages granted for the establishment of these small entities should help rural areas reduce the regional inequalities that Tunisia has experienced since its independence in 1957. The distribution of the *Regional Development Index* (RDI), an indicator of regional economic performance in Tunisia developed by the Tunisian Institute of Competitiveness and Quantitative Studies (TICQS), shows a deep heterogeneity and inequality spread between the different regions of the Tunisian territory (TICQS, 2012). Micro-enterprises<sup>2</sup> have recorded an increase of their share of enterprises for the last twenty years in Tunisia (Rijkers et al., 2014), in line with government policy. In this paper we evaluate their contribution to “RDI” using spatial measures and spatial econometric techniques<sup>3</sup>. This way we test whether the assumption of a positive contribution by micro-enterprises to regional economic development, actually holds in practice.

Regional development is important in developing countries where typically, huge inequality exists between the capital region and their peripheral counterparts. This phenomenon of regional disparities has many drawbacks in the case of Tunisia. In particular, it encourages the migration from poor disadvantaged areas to the relatively more developed coastal regions, then creating, around the coastal cities, sub-groups of poor citizens agglomerated to the local urban systems (Chabbi, 1986). While inland areas are lagging behind in terms of development compared to coastal areas, there is also considerable heterogeneity in terms of development within the coastal areas.

We conduct our analysis by utilizing spatial econometric techniques because they better control for both spatial dependency and unobserved heterogeneity. Explicitly, we argue that interactions between regions matter in explaining differences in the regional development level. We contend that the level of development (proxied here through “RDI”) that prevails in a region may be influenced not only by the conditions that prevail in that specific region but it may also be influenced by the neighboring conditions.

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2. A micro-enterprise is defined by the criteria relative to the legal status of the unit (physical persons), to the size of the enterprise in terms of number of employees (employing under 6 salaried people but up to 6 job positions including the owner of the firm); according to the presence or absence of proper bookkeeping, micro-enterprises belong to the formal or to the informal sector (National Institute of Statistics –NIS–, 2014, p. 9).
  3. We retained only micro-enterprises that hire from 1 to 5 salaried people; hiring people constitute the sign of a real activity. So we excluded the (solo) self-employed population due to their possibly non-permanent or partial activity.

From this spatial standpoint, we consider that there are two distinct mechanisms by which micro-enterprises may influence regional development. In addition to the ‘direct’ mechanism that refers to the direct impact of micro-enterprises on regional development (in terms of value creation), the ‘indirect’ mechanism lies on the influence of micro-enterprises that results from the possible spatial effects. More precisely we argue that a change in micro-enterprise density in a region will influence both the “RDI” in that region and the “RDI” in neighboring regions by means of regional spillovers (Van Stel and Storey, 2004).

The originality of this paper is to highlight the spatial aspect, specifically the neighborhood (i.e., adjacent regions), to study the impact of micro-enterprises on the level of development of regions in Tunisia. The methodological contribution of this paper is to approach this effect by considering a database of 262 Tunisian regions (‘delegations’)<sup>4</sup> observed in 2010 and by using both global and local spatial regressions. The low spatial aggregation level (i.e., the small scale of the regions) is particularly appropriate to apply spatial econometric techniques. Contentwise, the contribution of this paper is to evaluate to what extent micro-enterprises indeed contribute positively to regional development in Tunisia (the implicit government assumption behind the stimulation of micro-enterprise creation), and if this contribution varies across different parts of the country.

The remainder of this study is structured as follows: First, we begin with a review of the literature dealing with the relationship between entrepreneurship and regional development. Then we present the variables and the methodology. The following section presents the results and their interpretation. Finally the last part concludes the paper.

## 2. Literature Review

The entrepreneur is seen as an important driver of economic development, employment and productivity growth (Wennekers et al., 2005). According to Feldman (2001) and Audretsch and Fritsch (2002), the most appropriate dimension for studying entrepreneurship is the regional dimension (see also Backman and Karlsson, 2013, and Casares and Khan, 2016). Indeed, the

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4. The Tunisian territory is divided into 24 governorates (equivalent to the French departments), each subdivided into delegations (a total of 262 inland delegations and an island, Bouhajla) (Turki and Verdeil, 2015). We retain inland delegations for the purpose of the article. Delegations have geographical and / or demographic coherence. Indeed, the delegation covers a territory of limited extent, which should enable the population of the agglomerations to easily visit its main town to find public or private service activities (in particular a hospital or dispensary, a secondary school, etc.). In urban areas, the division is mainly based on demographic coherence - a delegation has several tens of thousands of inhabitants in general - while in rural areas, the division is mainly geographically coherent, with a population of a few thousand of inhabitants only. For example, the Hazoua delegation in Tozeur governorate, a few kilometers from the border with Algeria, has a population of 4,162, but it is located in a desert environment with a strong dispersal of the habitat.

Knowledge Spillover Theory of Entrepreneurship (KSTE), (Acs et al., 2009), highlights the importance of the local mix of entrepreneurs and knowledge that is mainly disseminated by research centers and universities. Many works now incorporate an entrepreneurial variable in the orthodox regional theory of growth or consider the importance of studying entrepreneurship and its consequences at the regional level: Audretsch and Fritsch (2002), Carree et al. (2015), Van Stel and Storey, (2004), Fritsch and Mueller (2004), Audretsch and Keilbach (2004), Fritsch (2008), Sternberg (2009), Fritsch and Schroeter (2011), Dejardin and Fritsch (2011), Fritsch and Wyrwich (2017), Van Oort and Bosma (2013), Abdesselam et al. (2014), Aubry et al. (2015), etc.

In this literature, the environment of new-firms startups is part of the scope of the value creation. Audretsch and Fritsch (2002) determine different “entrepreneurial regimes” more or less favorable to the creation of jobs; Fritsch (2008) and Fritsch and Schroeter (2011) suggest that the influence of business creation on job creation differs between regions; the most productive of them are the most likely to benefit from new-firms startups: by high quality entry (Fritsch, 2008, Fritsch and Schroeter, 2011) or by entrepreneurship oriented towards export (González-Pernía and Peña-Legazkue, 2015). It is then important to consider the local environment of the new-firm and the quality of entry. For example, due to formal and informal institutional factors, some evidence of unemployment-push into self-employment is found for the majority of the regions of France (Abdesselam et al., 2014). Yet, the Île-de-France region (the most developed region in France) is an exception since the “Schumpeter” effect prevails in the long term (Aubry et al., 2015). “Since regions differ in terms of their regional entrepreneurial framework conditions (which influence entrepreneurial activities and attitudes), it makes little sense to apply global entrepreneurship theories, as they do not apply to the same extent in every region (even though some theories apply to many regions). Rather, there are various theories that are each valid for specific regional framework conditions” (Sternberg, 2009, p. 5).

Tunisia belongs to the group of efficiency-driven economies (WEF, 2017). According to Naudé (2010), in developing countries, entrepreneurship remains essential for structural change, contributing to the transformation of agricultural economies into knowledge and service economies. Yet, because microenterprises are very small enterprises, some authors retain certain advantages to this type of firms but also some drawbacks. Regarding advantages of (very) small firms, these enterprises are more labor intensive, i.e. more able to employ or create jobs for a certain amount of production, less sensitive to crisis because stronger ties are developed inside the firm between managers and employees, and they are also typically family firms so that the family extended the culture to the whole enterprise, preventing layoffs as much as possible. Regarding drawbacks, “Others (authors) suggest that because most microenterprises are drawing from secondary labor markets (e.g., lower education levels, women, minorities, immigrants, etc.)

the promotion of small business may represent a poverty mitigation strategy (Partridge and Rickman, 2006)", (in Deller, 2010, p. 72).

Yet, New Geographical Economy has shown the presence of multiple equilibriums and spatial heterogeneity of regional development. In this framework, we propose a local variation of the "classical" spatial econometric models via geographically weighted regression (GWR) to address the problem of non-stationarity of territorial development. First, we will estimate the effect of micro-enterprise density on "RDI" at the delegation level throughout Tunisia. Then, applying GWR techniques, we address the question of spatial heterogeneity of the impact of micro-enterprises on the level of regional development. For example Shrestha et al. (2007) show that entrepreneurship (lagged growth of proprietorship) causes greater marginal effects on the determinants of the growth of jobs in metropolitan counties in the case of the United States.

We may expect that significant differences exist between inland regions, less developed and coastal regions that benefit from tourism and industrial exporting oriented zones. We assume that the causation from micro-enterprise to "RDI" is more plausible than vice versa, notwithstanding the limitations of the cross-sectional approach.

### **3. Research Design and Methods**

#### **3.1. Empirical Setting: Tunisia**

In Tunisia, small and micro-enterprises constitute the overwhelming majority of the production base. Micro-enterprises (less than 6 salaried) represent 97.13% of the total of enterprises registered in the repertoire of businesses at the end of the year 2012. They represent 24.4% of the total employment of the country which is around 2 725 400 employees, including independent, -with the exception of the agricultural sector- (NIS, 2014, p. 10). Three quarters of the jobs in micro-enterprises are recorded in firms with 1 or 2 employees and 21.4% of the jobs are concentrated in firms of 3 to 5 employees.

Population and economic activities are mainly concentrated in the North-East and Coastal regions. The "White Book" published in 2011 by the Ministry of Regional Development and Planning of Tunisia presents descriptive statistics of this regional inequality (Boulila et al., 2011). The coastline captures more than 80% of the surface of industrial areas and includes 76% of the countries' urban population in 2010. This inequality is even clearer for private investments. Governorates located on the North coast (Bizerte, Monastir) benefit from the highest amounts of private investment per inhabitant. Meanwhile, the strip of territories consisting of the governorates of Kasserine, Sidi Bouzid, Kairouan

(Central-West) and Jendouba (North-West) present the most disadvantaged areas. Concerning the rate of unemployment of higher education graduates, Jendouba (40.1%), Sidi Bouzid (41.0%), Gabès (39.4%), Tataouine (39.1%) and Kasserine (38.9%) present almost the double of the national rate which was estimated at 23% in 2010 (Mokaddem, 2015).

All these factors stimulate the imbalance between the (developed) and the inner (lagging) delegations of Tunisia while reinforcing the exodus towards the large cities including the capital Tunis. In 2011, the Ministry of Regional Development and Planning in Tunisia collected a large database at the territorial level to construct a regional development indicator (“RDI”)<sup>5</sup>. The value of the standardized composite index ranges from 0 to 1. The usefulness of this indicator is to quantify the reality of development in each delegation by taking into account the intrinsic disparities and to guide the decisions of the State for investments. According to the values of this indicator, the most highly developed delegation of Bab Bhar (located in the North-East) recorded an “RDI” value equal to 1. In contrast, the least developed area of Hassi Farid (situated in the Center West) recorded an “RDI” value equal to 0 (see Appendix 1: Table A1 and Figure 1).

### 3.2 Variables and Data Description

The dependent variable in this study is the Regional Development Index (“RDI”) in a delegation “i”, which measures the global development of an area based on various variables issued from different fields. The density of micro-enterprises (ENTERP) is the main independent variable. It is a broadly accepted measure of entrepreneurial activity. A larger value of (ENTERP) denotes a higher entrepreneurial activity. We expect a positive relationship with “RDI”.

The control variables are as follows. Three variables show the share of firms in three sectors, namely; manufacturing, wholesale and retail intermediaries and the third sector of the hotel and catering industry. These control variables are usual indicators of the relative specialization of the region. They enrich our discussion about the results.

The amount of projects funded by the Tunisian Solidarity Bank<sup>6</sup> constitutes another control variable. This institution is an essential lever for development policy of the government. Under the supervision of the Ministry of Finance and the Central Bank of Tunisia (BCT), it aims to provide financing for people who

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5. The composition of the Regional Development Index is extensive and includes 129 initial variables that are resumed, in a first step, to 26 variables thanks to data analysis methods. Then a Principal Component Analysis (PCA) in three steps leads to an index of the regional development. The level just under the regional development index compounds variables relative to the convenience of life (infrastructures, health), social environment (social, demography, education), economic activity (absorption activity, specialization) and labor market (enterprise employment, vulnerability of the labour market). Data are then normalized at the level of delegations (TICQS, 2012).

cannot gather the necessary resources or offer sufficient guarantees. It has been an alternative to the traditional banking system by financing numerous micro-projects and micro-enterprises of young promoters (Dioh, and Laroussi, 2009). It should be positively correlated to “RDI”.

Finally two variables representing the functioning of the labour market have been included. Qualified employment seekers (higher education graduates) and Unemployed youth (between 20 and 30 years’ old). “Young people have unemployment rates that are between two and four times the unemployment rate for adults”, (Haouas et al., 2012, p. 404). And this rate of unemployment is also very different according to the level of education of the population with the surprising characteristic that the level of education does not prevent from unemployment, with even a deterioration of job prospects for higher educated workers of all ages in the long term. “While the youth have experienced the highest levels of unemployment, it is clear that the demand for college graduates is simply not keeping pace with the increased supply of educated workers in the past decade” (Haouas et al., 2012, p. 405). We may think that higher educated population searching for a job may have a positive or a negative impact on the “RDI” depending on whether it reflects an attractive labour market for this kind of population (unemployment of growth) or an insufficient supply of qualified jobs at the regional level. For the rate of Unemployed youth, we postulate a negative link with “RDI”. See Table 1 for a detailed description of each variable.

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6. The Tunisian Solidarity Bank (BTS) was created in 1997 at the initiative of the Tunisian State to finance young graduates of higher education and vocational training. The bank specializes in mesofinance for the promotion of very small businesses (TPE). It has a capital of 40 million dinars (54% public holdings and 46% private holdings) with a shareholding base (more than 220,000 shareholders). <http://www.bts.com.tn/la-banque/>

Table 1: Variables' description and data source

Variable (abbreviation)	Definition	Descriptive statistics			
		Mean	Minimum	Maximum	Std.Dev
Regional Development Index (RDI)*	RDI is a compound indicator of 129 variables collected by National Institute of Statistics (NIS) and summarized into 26 variables by means of a principal component analysis. The value of the normalized composite index is comprised in a measurement interval of 0 to 1, bounded by two reference delegations.	0.318	0.000	1.000	0.158
Density of micro-enterprises (Per 1000 inhabitants) (0 employee excluded) (ENTERP)**	Density of micro-enterprises: number of micro-enterprises having less than 6 employees in a delegation divided by the total population of the delegation.	4.03	0.05	125.4	9.259
Enterprises in the manufacturing sector (Share of the total number of enterprises) (INDUS)**	Number of enterprises in manufacturing sector in a delegation divided by the total number of enterprises of the delegation, including the 0 employee firms <sup>a</sup> .	0.118	0.019	0.614	0.066
Enterprises in wholesale and commercial intermediaries sector (Share of the total number of enterprises) (TRAD)**	Number of enterprises in wholesale and commercial intermediaries sector in a delegation divided by the total number of enterprises of the delegation, including the 0 employee firms.	0.049	0.011	0.143	0.02
Enterprises in hotel and catering sector (Share of the total number of enterprises) (HCR)**	Number of enterprises in hotel and catering sector in a delegation divided by the total number of enterprises of the delegation, including the 0 employee firms.	0.049	0.010	0.151	0.0177
Amount of projects funded by the Tunisian Solidarity Bank (Unit dt/per inhabitants) (CTSB)**	Amount of investment of projects supporting regional development in a delegation financed by the Tunisian Solidarity Bank divided by the total population of the delegation.	88.32	0.788	4555	290.340
Qualified employment seekers (Per 1000 inhabitants) (UNEMPGRAD)**	Number of qualified unemployed <sup>b</sup> in a delegation divided by the total population of the delegation.	10.63	0	62.08	11.621
Unemployed youth aged between 20 and 30 years (Per 1000 inhabitants) (UNEMPY)**	Number of young -between 20 and 30 years- unemployed in a delegation divided by the total population of the delegation.	21.06	0.85	142.08	21.604

a. As we cannot differentiate firms according to the size in the sectoral partition by region, the figures relating to the number of firms of all sizes divided by the total number of enterprises of the region, include the "0" employee firms.

b. Qualified employment seekers are defined as the population of higher education graduates that are looking for a job. Since we don't have the unemployment rate at the delegations' level, we divide this number by the total population of the delegation.

\* Source: Ministry of Regional Development and Planning of Tunisia

\*\* Source: National Institute of Statistics of Tunisia

The variables published by the Ministry of Regional Development and Planning in 2010 are derived from two sources of information: the General Commissioner for Regional Development and the Tunisian Competitiveness and Quantitative Studies Institute.



### 3.3. Empirical Strategy

We propose a local variation of the "classical" spatial econometric models (Elhorst, 2014) via the geographically weighted regression (GWR) to deal with the problem of non-stationarity of regional development. The choice of this method is partly motivated by the fact that, to date, we have identified less than a dozen studies using this technique, even though the research opting for this method is promising (Breitenecker and Harms, 2010). Usually the structure of spatial spreading between regions is modeled by a purely geographical neighborhood matrix  $W$  ( $N \times N$ ) compound of  $w_{ij}$  terms representing, that a region "i" interacts with all "j" regions situated within a certain distance. A global spatial model presents then an overall estimate for all points in space. A local spatial regression is a model based on locally linear regressions in order to obtain estimates for each point of space. Table 2 provides an overview of spatial models.

The GWR model is formalized as follows:

$$y_i = \sum_j x_{ij} \beta_j(u_i, v_i) + \varepsilon_i$$

Where  $(u_i, v_i)$  is the location in a geographical space of the "i<sup>th</sup>" observation. In the calibration of the GWR model, it is assumed that the observed data close to an "i" point have more influence in estimating the values of  $\beta(u_i, v_i)$  than the data located away from "i". Fotheringham et al. (1996) discusses the reasons for estimating the set of weighted least squares parameters on a subset of points in the neighborhood of the estimation point. The weights  $w_{ij}$  used are constructed from decreasing functions of the distance between the estimation point "i" and the individuals "j", such as the Gaussian function. See Figure 2 in Appendix 2.

Table 2: Summary of spatial global/local models

Model	Abbreviation	Structure
Global spatial model	Spatial Autoregressive Model	$Y = \rho WY + X\beta + \varepsilon$
	Spatial Error Model	$Y = X\beta + \varepsilon$ with $\varepsilon = \lambda W\varepsilon + v$
Local spatial model	Geographically Weighted Regression	$Y_i = XW(u_i, v_i)\beta_i + \varepsilon_i$
<b>Parameters</b>		Y: dependent variable ("RDP") X: regional independent variables (Enterp, TSB, Qualif, etc.) W or $W_i$ : matrix of spatial interaction of the structure of dependency between the observations $\rho$ : Autoregressive spatial parameter measuring the intensity of the interaction between the values of Y. $\lambda$ : spatial parameter reflecting the intensity of the persistent spatial correlation between the residues. v: is an error term, it follows a normal law of a zero mean and a constant variance. $(u_i, v_i)$ : the location in a geographical space of the "i <sup>th</sup> " observation

In the global model, statistical inference based on OLS is not reliable in the presence of spatial autocorrelation. Spatial models correct for such presence. A global spatial model can be a spatial error model where the spatial dependence is carried by the errors, or a spatial autoregressive model where the spatial dependence is carried by the variable to be explained.

The GWR technique allows local estimation of regional development index levels and a test of their spatial variability. This method is based on locally linear regressions in order to obtain estimators at each point in space. It uses sub-samples of data, made up of neighboring observations. The choice of sub-samples refers to the distances between the observations of each regression point, in this case the Tunisian delegations. The estimation procedure is based on a Gaussian principle where observations closest to the regression point have weights greater than farthest observations. By moving a weighted window over the data, GWR estimates one set of coefficient values at every chosen 'fit' point. It allows identifying local spatial variation of coefficient for each explanatory variable (Brunsdon et al., 1996). In other words, GWR estimation allows us to investigate whether the relationship between micro-enterprise density and "RDI" varies across regions.

## **4. Results**

We implement first a spatial error model (SEM)<sup>7</sup> and then the GWR technique.

### **4.1. SEM Estimation (Spatial Error Model)**

Table 3 presents the results of ordinary least squares regression and the estimates of the models taking into account the spatial effect: the Spatial Error Model.

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7. The choice of this specification is driven by tests that are not presented here but are available upon request to the authors. In the spatial model the minimal critical distance is the distance ensuring at least one neighbor for each delegation. This distance is 81 km: it insures a connection between the largest delegation in the very south of Tunisia (Ramada) and its closest neighbor (Dhiba) -distance is calculated between the two centroids- (see maps in annex).

Table 3: Estimation global spatial results

Variables	Ordinary Least Squares Model	Spatial Error Model
INTERCEPT	0.1143***	0.1546*
ENTERP	6.3340***	4.5454***
INDUS	1.1860***	0.6988***
TRAD	0.8579**	0.9619**
HCR	0.378	-0.0637
CTBS	$7.116 \cdot 10^{-3}$	$-3.80 \cdot 10^{-3}$
UNEMPGRAD	1.0834**	2.300***
UNEMPY	-1.1529***	-1.001***
Lag Coeff (Lambda)	---	0.907***
R-Squared	0.532	0.763
Log Likelihood	211.986	292.57
AIC	-407.972	-569.145
Number of observations	262	262

Dependent variable: "RDI"

\*\*\* Significant at 1%, \*\* significant at 5%, \*significant at 10%.

The OLS model is not valid here because there is a spatial dependence. This spatial dependence is measured by the lag coefficient (Lambda) that is significant in the SEM. It means that an unexpected (random) increase in the regional development index of a delegation will have a positive impact on the regional development indices of the contiguous delegations - with a strong overall effect of 90.7% -. In this case this shock spreads first on the closest delegations to the most distant ones with cumulative positive effects that would represent 90.7% of the initial shock. So we will interpret results from the SEM.

Our results suggest that the density of micro-enterprises (ENTERP) positively and significantly affects "RDI" measured at the level of delegations. These results are consistent with Deller and McConnon (2009) who studied the relationship between micro-enterprises and regional economic growth. Audretsch and Keilbach (2004) also provide empirical evidence that regions with higher levels of entrepreneurship exhibit stronger growth in labor productivity.

A high proportion of unemployed young people in the total population is negatively and significantly related to the level of development of delegations and its neighboring delegations. High youth unemployment is probably one reflection of a poorly developed region, i.e. the direction of causation may be reversed here. On the other hand, according to Ouanes (2016), Tunisian young people are not creative; they are risk averse and strongly attracted by the public sector because of a perceived combination of advantages of the civil servant status (financial stability and permanent increasing salary, quality of life). This attitude and lack of entrepreneurial spirit among unemployed young people would be in line with a negative causal impact of the variable UNEMPY on the "RDI" variable.

The presence of a high share of skilled unemployed people among the population in a delegation is positively and significantly related to "RDI". There

are not enough high qualified jobs at the national level, in Tunisia, for a population that is rather young and educated. Qualified jobs are concentrated in delegations with a high level of regional development and arouse immigration flows of young educated people. Hence, also here the causation is likely reversed: high “RDI” regions attract skilled (potential) workers. The immigration of young educated people to the big cities contributes to the imbalance between academic training and labor market offers. The phenomenon of the unemployment of graduates in Tunisia seems increasingly difficult to contain, to the point of still presently constituting the black spot of the economy. Neither the 5-6% GDP growth per year, nor the various measures taken (tax incentives to attract foreign companies to Tunisia, state subsidy of employment to hire in Tunisian companies, incentives for students to extend their studies, etc.) still seem to have any positive effects at this date (Robalino et al., 2009, report 1). Each year, 85,000 people enter the labor market for only 60,000 to 65,000 additional jobs. The massive education and training policies deployed in the sixties since independence are now showing their limits<sup>8</sup>: there is a case of overproduction of qualified workers, despite strict control of the rate of population growth, and sustained economic development. The structure of the economy could not absorb all these newcomers into the labor market and the third report (Grun et al., 2009, report 3) reveals that a 10% growth rate would be required to absorb all.

#### 4.2. GWR Estimation (Geographically Weighted Regression)

After interpreting our global spatial model, we ask ourselves whether each variable has the same impact on all the 262 delegations; one can suspect that the impact of a variable on the “RDI” varies from one delegation to another. The point from this perspective is to study the aspect of spatial heterogeneity. To answer this query we use the geographically weighted Regression (GWR) model to interpret the spatial heterogeneity of the results.

The GWR technique allows local estimation of regional development levels and a test of their spatial variability. This method is based on locally linear regressions in order to obtain estimators at each point in space. It uses sub-samples of data, made up of neighboring observations. It is assumed that the relationships modeled vary in space. This spatial non-stationarity implies that some variables may have a positive effect in some regions, while negative effects might be observable in others (see figures 3-8 in annex). The principle of the Geographically Weighted Regression is to estimate locally the model specified on the studied territory. A local estimation of the coefficients is done using a weighted least squares version.

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8. Habib Bourguiba became the first President of Tunisia in 1957. He is the founder of the modern Tunisia, establishing a modern education system aiming at educating Tunisian people. He clearly based his priorities on education and health, to the detriment of military expenditure.

To date, studies that use this technique in research on the role of entrepreneurship in regional economic development are emerging and promising (Breitenecker and Harms, 2010). Recent works using the GWR show the spatial variations of the determinants of business creation (Cheng and Li, 2011; Breitenecker et al., 2017). Deller (2010) analyzes the role of microenterprises on regional growth in US counties and explains that there is spatial heterogeneity of this relationship depending on the type of industry and their size. Xu and Lambert (2011) highlight the heterogeneous effects of business creation on economic growth in the Appalachian regions.

In our analysis, the GWR shows an improvement of the results compared to the conventional model and the SEM: This improvement is detected through the shift of R-Squared value from 0.763 to 0.873 and the decrease of AIC that denotes an improvement of the modelization<sup>9</sup>. The results clearly show a significant variation of the micro-enterprises variable in the strength of the relationship with the “RDI” variable but not its direction. In other words, micro-enterprises have a positive impact on the level of regional development for all Tunisian delegations, but this impact varies between the delegations (weak / strong). Because it is burdensome to present the 262 estimates<sup>10</sup>, the GWR results related to each variable are mapped (Appendix 3). Table 4 presents the summary statistics for varying local coefficients.

Table 4: Summary statistics for varying local coefficients

Variable	Mean	Min	Max	Median
Intercept	0.194	0.080	0.317	0.160
ENTERP	12.40	3.070	45.365	6.070
INDUS	0.917	0.501	1.861	0.875
TRAD	0.505	-1.623	2.918	0.0793
HCR	0.184	-1.275	1.264	0.032
CTBS	-0.117	-0.385	0.421	-0.139
UNEMGRAD	1.119	-1.254	5.053	0.877
UNEMPY	-0.521	-1.677	0.370	-0.41

The compilation of the minimum and maximum values of the local estimators indicates the direction and strength of these variables with the level of regional development.

In Table 4, we find that the minimum and maximum value of the variable ENTERP (min = 3.070, max = 45.365) indicates that this variable is in the same direction with the level of regional development for all regions of Tunisia.

9. The AIC criterion, which is a performance measure for the model, emphasizes the advantage of the passage from a global spatial model to a local spatial model measured by the GWR. This improvement is assessed by the decrease of the value of AIC from -569.145 (global spatial model) to -674.943 (local spatial model).

10. The result of 262 estimates is available on request.

However, we note significant regional variations in the strength of the relationship with the “RDI” variable.

Figure 3 in Appendix 3 shows the impact of the variable ENTERP on the set of points in space. It shows that the impact of microenterprise is greater in regions with low levels of development than those with favorable development. Specifically, moving away from the most underprivileged developing regions (mainly located in Central West and North West Tunisia<sup>11</sup>), the impact of micro-enterprises remains positive but weakens when moving closer to the regions which are better developed.

While enterprise creation is widely discussed as a backbone of economic development in Tunisia (TICQS, 2012), our results clearly show that the location of microenterprises in developed regions does not have a significant impact on development. This is due to the fact that micro-enterprises located in developed – innovative and/or export oriented – delegations, are probably more necessity-driven rather than growth-oriented.<sup>12</sup>

Conversely, the presence of microenterprises in poor developing delegations contributes positively and strongly to improve the regional development index of these delegations and their neighbors. In this perspective, the presence of micro-enterprises in disadvantaged regions is a lever in regional development. One interpretation could be that, in the poorest delegations, micro-enterprises are the main contributor to added value. They are also relatively protected against the competition of bigger firms that are not located in these delegations. These small entities are then an alternative to boost the regional environment and promote an acceptable level of development for these delegations. Nevertheless, although micro-enterprises are apparently a reasonable alternative for regions that lack big firm presence, “RDI” in such regions is likely to be stimulated much stronger by the attraction of bigger (possibly foreign) firms (Wennekers et al., 2005).

We also observe that the INDUS variable (Figure 4 in Appendix 3) shows the same direction with the level of regional development in all delegations; the difference is that the main positive effect is recorded in delegations that are not the poorest but in the third quartile and located in the North-East. One interpretation could be that to benefit fully of the presence of industrial activities, delegations must be sufficiently developed and also relatively well connected to main roads and harbors (Bizerte, Tunis-Goulette) to export.

The main positive relations with TRAD are spread in Tunisia, in the Center-west with a group of delegations -the main positive effect is recorded for the

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11. These delegations are: Ghardimaou, Oued Meliz, Nabeur, Sakiet sidi yousef, Kef Est, Bourouis, Èsers, Tajarouine, Dahmani, Siliana nord, Djerissa, El Ksour, Makthar, Hidra, Thala, El rouhia, Sbiba, Sbeitla, Majel bel abes and Hassi Farid.

12. In that case the presence of modern industrial companies may lead to the disappearance of fragile activities carried out by micro-enterprises. For example, the relationship between agriculture and crafts is disappearing: previously, wool was spun locally, whereas today it is made in industrial type spinning. Pottery follows the same process; rare are the branches that resist this evolutionary process in developed areas with high dynamism and competition.

delegation Sidi Aïch that has an “RDI” of 0.146 only-, in the North-east with Mateur and Utique (“RDI” of 0.346 and 0.325 respectively), in the East with Boumerdes and Bekalta (“RDI” of 0.309 and 0.388 respectively) and in the South-east with Ben Gardane and Smar (“RDI” of 0.273 and 0.122 respectively). It concerns delegations that may have a weak or an average “RDI”.

The main positive relations with HCR are recorded on the West part of Tunisia in the delegations of the governorates of Sousse, Monastir and Madhia. These coastal delegations are touristic. The main positive relations with UNEMPLGRAD are recorded in the delegations of the governorates of Monastir, Madhia, Sfax and the South-west part of the governorate of Kairouan. These governorates are the most attractive for graduates.

## 5. Conclusion

In this article, we investigated the relationship between the presence of micro-enterprises and regional development, as measured by a validated index of regional development, at the level of 262 Tunisian *delegations* (small-scaled regions). We first proceeded by estimating our global spatial econometric model measuring the average impact of the neighborhood. At this stage, our results support the hypothesis of a positive relationship between the presence of micro-enterprises and the index of regional development measured at the delegation level. From this perspective, microenterprise promotion is considered as a condition to improve the well-being of locals by providing significant revenue which may contribute to foster regional growth. Yet the results from the GWR analysis nuance those obtained in the global model. More precisely, we found that micro-enterprises present an important lever for economic development in disadvantaged areas whereas they have a much weaker link with regional development in advantageous areas.

In the higher developed regions of Tunisia, economic development is spurred by bigger firms that exploit economies of scale and scope, following the growth model of efficiency-driven economies (as Tunisia is; see WEF, 2017). In such regions, micro-enterprises play a marginal role at best. In particular, talented, skilled employees will be more productive working as an employee in a bigger (possibly foreign) firm rather than starting their own micro-enterprises, unable to exploit economies of scale that is the engine of growth in efficiency-driven economies. On the other hand, in the absence of large firms, our results also show the important and positive role that micro-enterprises can play in disadvantaged regions. Nevertheless, in such regions stimulating micro-enterprise creation should still be considered a short-term, temporary solution to spur economic development, as in the longer term, policies to attract foreign direct investment (FDI) are likely much more productive (Wennekers et al., 2005).

From an academic point of view, this work sheds new light on the concept of regional disparity and its connection to the presence of micro-enterprises, especially in underdeveloped Tunisian delegations. In a future work, in delegations benefiting from these small economic entities, it would be relevant to conduct a field study interviewing the entrepreneurs managing micro-enterprises in order to properly evaluate the local entrepreneurial ecosystem. Such an evaluation should also consider if the ecosystem has the infrastructure in place to realise firm growth by promising, already existing young firms or if the infrastructure is attractive to foreign multinationals. Ultimately, economic development at the efficiency-driven stage is achieved by realizing a certain scale of operations.



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## Appendices

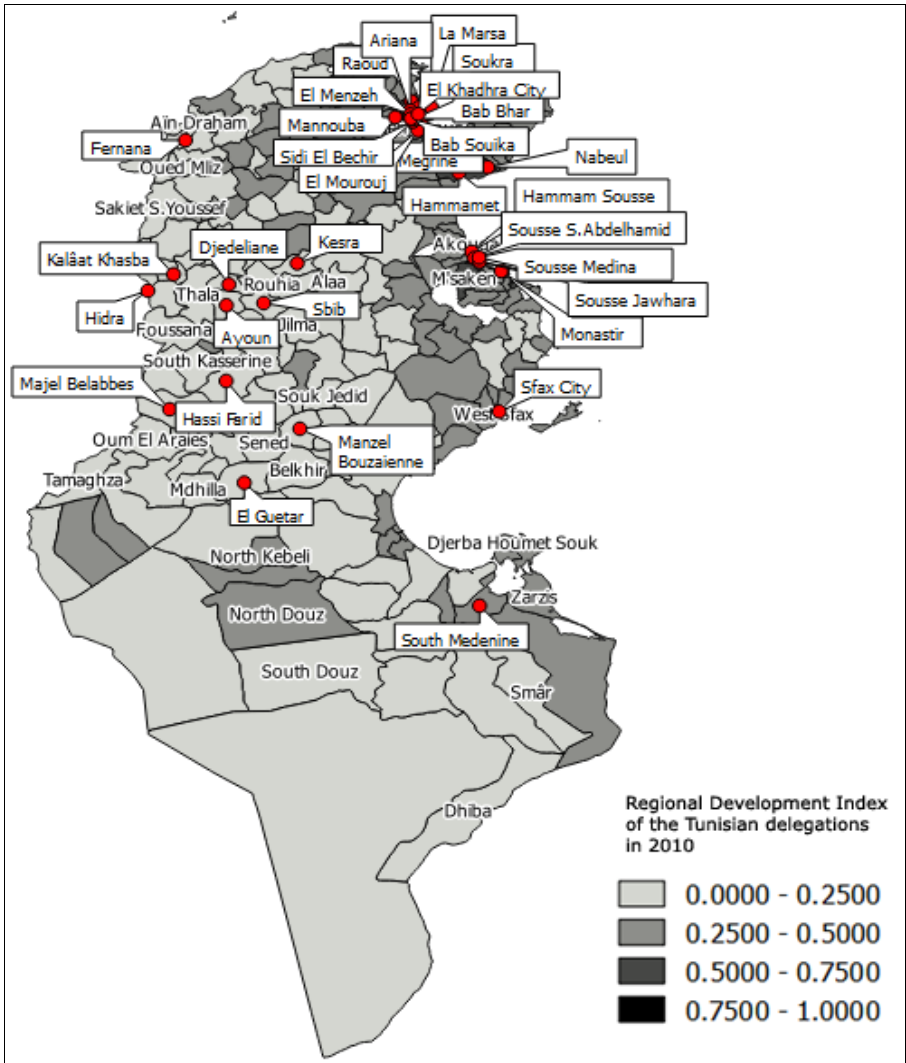
### Appendix 1: RDI rankings 2010

Table A1: Ranking of the Regional Development Index for fifty delegations in 2010

Ranking	The twenty-five delegations with the highest development index		The twenty-five delegations with the lowest development index	
	Name of delegation	RDI	Name of delegation	RDI
1	Bab Bhar	1	Kesra	0.124
2	Bab Souika	0.922	Jilma	0.123
3	Cité El Khadhra	0.791	Smâr	0.122
4	Sousse Medina	0.686	Mdhila	0.118
5	Sousse Jawhara	0.679	Sbiba	0.115
6	Sousse S.Abdelhamid	0.657	Rouhia	0.115
7	El Menzah	0.654	Menzel Bouzaine	0.112
8	L'Ariana Ville	0.638	Foussana	0.112
9	Hammam Sousse	0.624	Tamaghza	0.112
10	Monastir	0.620	Dhiba	0.109
11	La Goulette	0.610	Djedeliana	0.108
12	La Marsa	0.588	Sned	0.104
13	Sfax Ouest	0.572	Kâllat Khasbah	0.104
14	Mannouba	0.570	Sakiet Sidi Youssef	0.102
15	Soukra	0.557	Oued Meliz	0.099
16	El Mourouj	0.557	Kasserine Sud	0.095
17	Sfax Ville	0.555	El-Alaa	0.092
18	Akouada	0.551	Fernana	0.091
19	Sidi El Bechir	0.545	Ain-Draham	0.089
20	Megrine	0.540	Hidra	0.078
21	Raoued	0.531	Belkhir	0.073
22	Hammamet	0.526	Majel Belabbes	0.044
23	Ezzahra	0.523	Souk Jedid	0.042
24	Nabeul	0.523	El Ayoun	0.005
25	M'saken	0.518	Hassi Farid	<b>0.000</b>

Source: TICQS (2012)

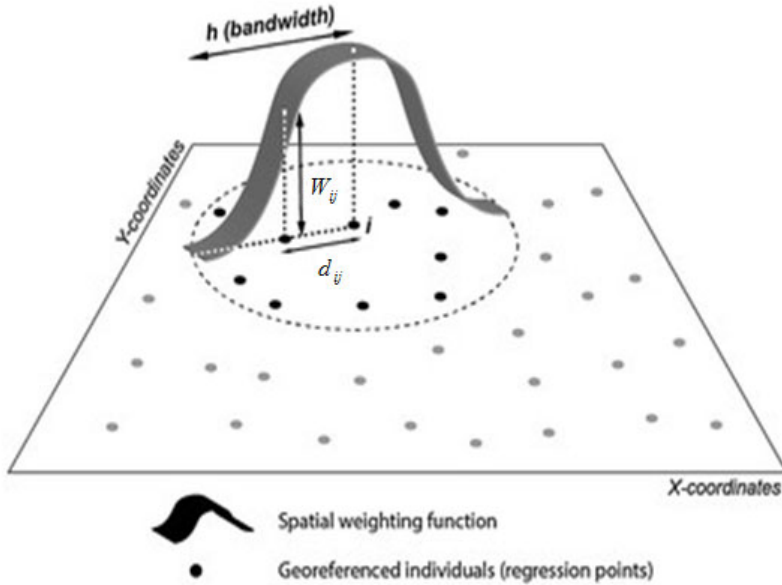
Figure 1: Distribution of the Regional Development Index of the Tunisian delegations in 2010



Conception: Authors  
Source: TICQS (2012).

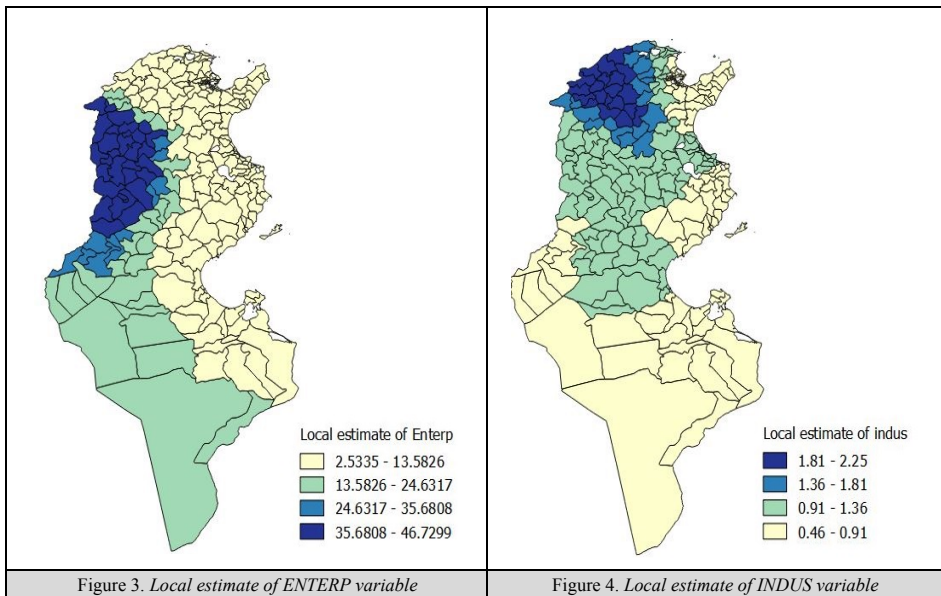
Appendix 2: Schematic representation of the geographically weighted regression

Figure 2: Schematic representation of the geographically weighted regression and its spatial parameters (adapted from Feuillet et al., 2015).



$$W_{ij} = \exp(-(d_{ij} / h)^2) \text{ if } d_{ij} > h \text{ then } W_{ij} = 0$$

Appendix 3: Geographically Weighted Regression Maps



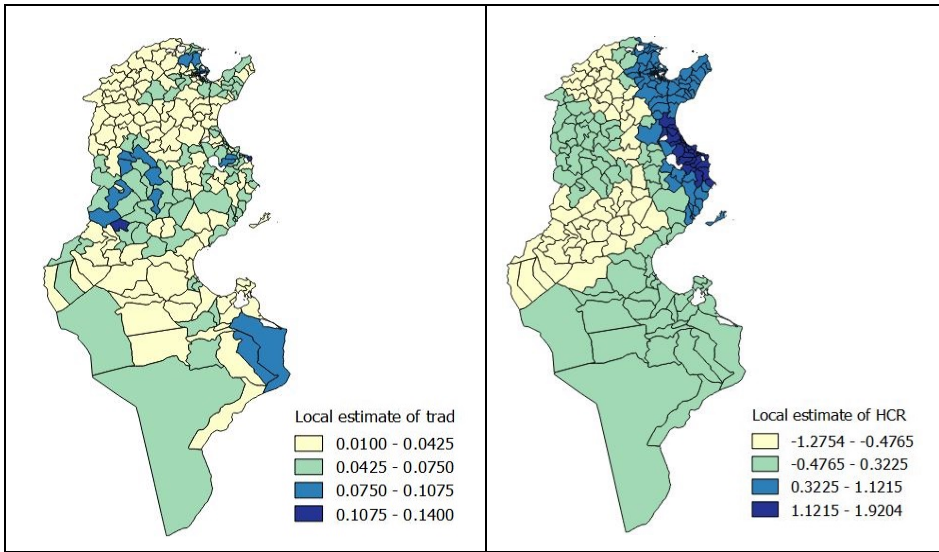


Figure 5. Local estimate of TRAD variable

Figure 6. Local estimate of HCR variable

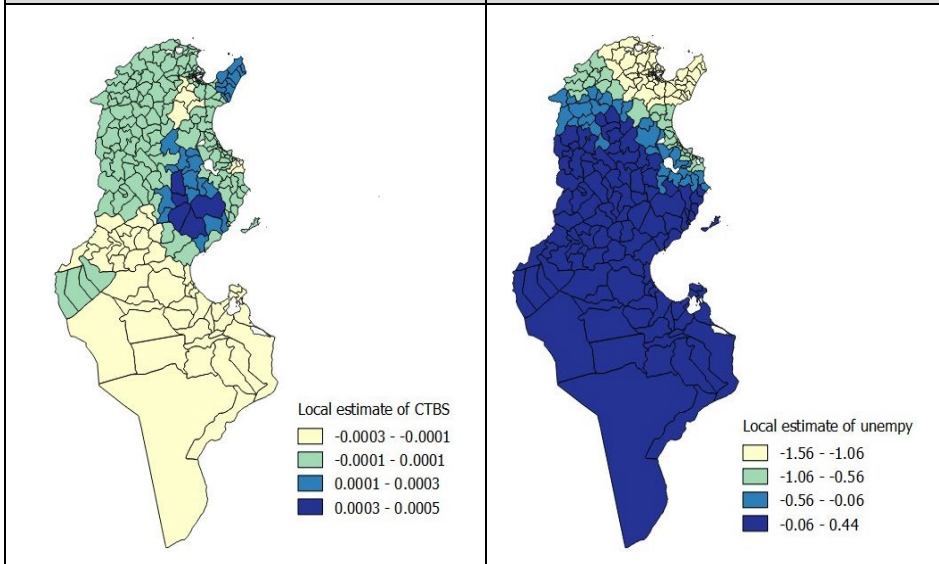


Figure 7. Local estimate of CTBS variable

Figure 8. Local estimate of UNEMPY variable

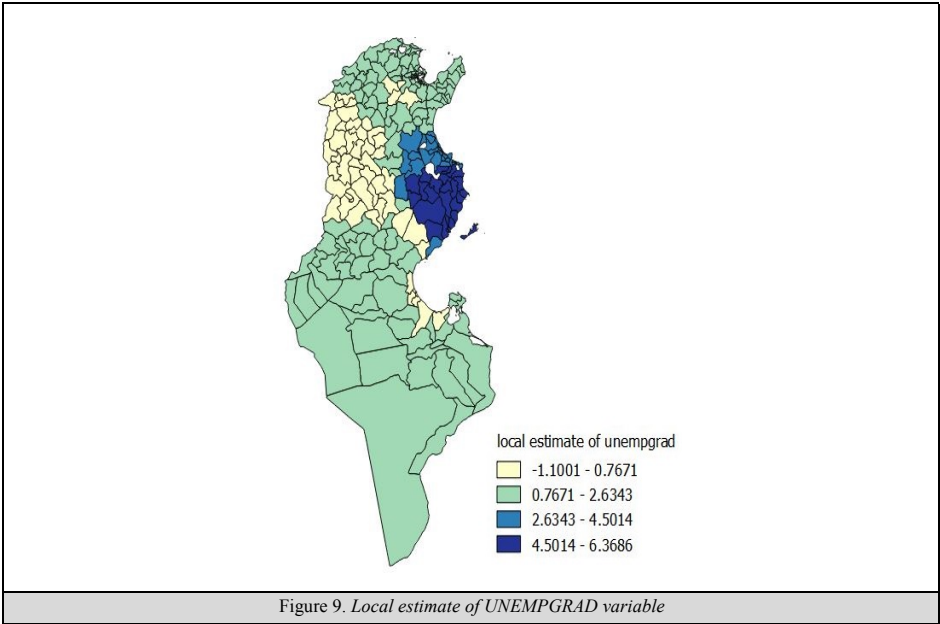


Figure 9. Local estimate of UNEMPGRAD variable

