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**ASSESSING INEQUALITY OF HUMAN OPPORTUNITIES:
A NEW APPROACH FOR PUBLIC POLICY IN TUNISIA**

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Abstract

The universally used socioeconomic indices like education and housing indicators (access to water, sanitation and electricity) appraise solely the coverage level of basic opportunities in a society without capturing the differential intensity across various subgroups. This paper provides a new application of the known Human Opportunity Index (HOI) in order to assess the inequality in distribution of basic services at the regional scale in one of the MENA's most unequal countries. Based on the differentiation between circumstance and effort variables in John Roemer's theory, we correlate inequality of opportunities with seven observed circumstances which are not controllable by individuals. Logistic regressions required to calculate various HOI indexes are used to estimate the contribution of main socioeconomic and demographic circumstances. Large and significant disparities particularly in access to safe water and sanitation have been detected between the Eastern (littoral) and Western (inland) areas. The residence area, the education level of the household head and the per capita household expenditure were the most important circumstances causing such regional disparities. The paper also affords some potential policy implications through the HOI estimation results.

JEL Classifications: D63, I24

Keywords: Circumstances; Human Opportunity Index; Inequality; Opportunities; Tunisia.

ملخص

تقيم المؤشرات الاجتماعية والاقتصادية المستخدمة عالمياً مثل مؤشرات التعليم والإسكان (الحصول على المياه والصرف الصحي والكهرباء) مستوى تغطية الفرص الأساسية في المجتمع دون تغطية الكثافة التفاضلية في مختلف المجموعات فرعية. تقدم هذه الورقة تطبيق جديد لمؤشر الفرصة الإنسانية المعروف بهيجن من أجل تقييم عدم المساواة في توزيع الخدمات الأساسية على النطاق الإقليمي في واحدة من أكثر البلدان الغير متكافئة في بلدان الشرق الأوسط وشمال أفريقيا. نقوم بربط عدم المساواة في الفرص مع سبعة ظروف لوحظت والتي لا يمكن السيطرة عليها من قبل الأفراد على أساس التمايز بين متغيرات الظرف والجهد في نظرية جون رومر، ونستخدم الانحدارات اللوجستية المطلوبة لحساب مختلف مؤشرات هيجن لتقدير مساهمة الظروف الاجتماعية والاقتصادية والديموغرافية الرئيسية. تم الكشف عن تفاوتات كبيرة وهامة وخاصة في الحصول على المياه الصالحة للشرب والصرف الصحي بين المناطق الشرقية (الساحل) و (الداخلية) الغربية. فنرى أن مستوى تعليم رب الأسرة والإنفاق المنزلي للفرد الواحد هي من أهم الظروف التي تسبب في الفوارق الإقليمية. تتيج الورقة أيضاً بعض الآثار المترتبة على السياسات المحتملة من خلال نتائج تقدير هيجن.

1. Introduction

A main progress in contemporary philosophy about social justice has been the theoretical integration of a basic role for personal responsibility into the definition of equality. Following Rawls (1971) and Sen (1980), some political philosophers and economists have started to ask what might be the accurate space in which fairness should be promoted. A differentiation began to be drawn between inequalities that are due to personal responsibility, and which may consequently be morally acceptable, and those that are not, and which may then be sorted as unfair. A main strand of this thought has sustained that egalitarianism of opportunity afford the right currency of egalitarian justice (Cohen 1989). Variants of this strand of thought have been suggested by Dworkin (1981), Arneson (1989), and Roemer (1993/1998). A recent and detailed summary of these approaches can be found in Fleurbaey (2008).

One of the major reasons of the Arab Spring is mainly the social and economic inequality added to corporate greed, corruption and influence over government. Indeed, Tunisian protesters confirm that the country had during the last decades much greater inequality than in the past although the Gini coefficient—the figure economists use to measure inequality—shows the inverse.¹ During this period, regional development has been very unequal. While the coastal region has generated more employment opportunities, especially in tourism, the rural Middle-West of the country, where the recent revolution started, was economically and socially marginalized, with no jobs and lack of infrastructure. Further South, particularly in Gafsa, a big protest movement took place in 2008 in response to marginalization. So Tunisia's economic miracle, as the former regime were pleased to say, has not benefited all, nor has it been matched by enjoyment of human rights. The high economic growth and the low absolute poverty rate of the country is often used as an argument to demonstrate the pertinence and the relevance of the socio-economic policy. Poverty and unemployment patterns at the country level may mask important variations and disparities in the regional poverty rates. Indeed, the poverty rate is at 32.3 percent in the Middle-West, 25.7 percent in the North-West and 21.5 percent in South-West, compared to 15.5 percent on the national level in 2010. The Middle-East (8 percent), Great Tunis (9.1 percent) and the North-East (10.3 percent) have the lowest poverty rates.²

Housing and education indicators such as access to water, sanitation and school attendance are generally used to assess welfare of society. Many economists, sociologists, demographers and some other development researchers consider these simple indicators as the most important tools for capturing social improvements in a given society. Nevertheless, these measures remain incapable of capturing the intensity of development across various socioeconomic subgroups.

Policymakers should take into account the development inequalities between regions for two reasons. Indeed, an unequal distribution in access to basic public services (housing services, education and others) means that growth benefits do not flow equally across the different groups and regions. A policy based on discrimination across regions is liable to create resentment and a sense of insecurity which may eventually lead to social unrest. The socio-psychological literature confirms this result by showing that the perception of elimination from social consumption norms affects both social stability and welfare. Then, policy-makers and donor agencies can assure social cohesion by fighting regional poverty, differences and inequalities.

Studying in depth the marked and persistent dissimilarities in basic opportunities can bring out the factors contributing to the overall poverty rate and thus prioritize the decisions that need to be taken to support regional development. However, perfect equality, which is considered the

¹ Over the past 25 years, the Gini coefficient for Tunisia has decreased from 0.434 to 0.361 between 1985 and 2010 (World Development Indicators).

² INS, "Mesure de la pauvreté et des inégalités en Tunisie 2000-2010.

focal goal of some social policies, may annihilate the incentives to innovate needed for economic development, as well as the high inequality which badly affects people's perception of fairness.

In economic literature, the Lorenz curve is commonly used to make spatial and temporal inequality comparisons. Based on this method, the living standards distributions in terms of inequality are typically ranked using the Gini index. Nevertheless, as it is well known, this index is highly sensitive to the welfare disparities which occur in the middle rather than at the tails of the living standards distribution (Anand 1983; Chakravarty 1990). In order to avoid such a distorted picture and to make the social policies aimed at reducing overall inequality between socioeconomic groups more wholesome, analysts have often used other inequality measures suggested either by Theil (1967) and Atkinson (1970). To give new insights to such indicators, Lambert (1989), Silber (1999), Atkinson and Bourguignon (2000) and recently Barros et al. (2009) proposed new techniques by which they have attempted to consider the between-group disparities. In some developing countries, for instance in Southeast Asia, Latin America or Africa, societies are more deeply divided along ethnic, regional, or religious lines. In such countries, a larger number of subgroups should be constructed to take into account the different socioeconomic factors and characteristics.

In this paper, we measure inequality of opportunity for education and basic services in Tunisia. We use the Human Opportunity Index (HOI) based on John Roemer's (1998) theory, developed and used for the first time by Barros et al. (2009). Another application can be found in Molinas et al. (2010). This composite index includes both coverage rates and equity in a single measure. The HOI indicates simultaneously how far a country or region is from the goal of providing equitable and universal access to a set of outcomes and services to all, and the degree to which each child in the area studied has an equal opportunity to benefit from those goods and services. In this paper we calculate the HOI for regions in order to establish a comparison between the different region's values of the index. The opportunity indexes selected to calculate the final HOI are associated to education and housing basic services (access to water and sanitation...) (Molina and Rao 2010).

The remainder of the paper is divided as follows. Section 2 briefly outlines the Roemer's theory. Section 3 presents a concise description and the conceptual underpinnings of the HOI. Section 4 describes the methodology and the data used to calculate the HOI, as well as the method of quantifying the relative contribution of each circumstantial variable to inequality of opportunity. Section 5 presents a cross-region comparison of inequalities in opportunity in all regions of the country. Section 6 concludes and summarizes the main findings of the study and provides some policy implications.

2. Roemer's Theory of Inequality

Roemer (1998) in his theory distinguishes between two principal factors that can explain the inequality in distribution of particular outcomes such as incomes. He identifies factors over which persons have a measure of control, as *efforts* (how long one studies or how hard one works, for example), whereas factors for which they cannot plausibly be held to have any liability are *circumstances* (for example: ethnicity, gender, or family background). Adopting this differentiation, he identifies *equality of opportunity* basically as a situation in which main outcomes, called *advantages*, are distributed independently of circumstances.

Based on Roemer's theory, Bourguignon et al. (2007) have considered the following model of advantage:

$$y = f(C; E; u) \tag{1}$$

Where y denotes the outcome of interest called advantage in Roemer's theory; C is a vector of circumstance variables; E denotes a vector of effort variables; and u represents the random

factors. Roemer (1998) assumed explicitly that circumstances must be economically exogenous, i.e. the individual can't control them. However efforts may be endogenous to circumstances in some cases as shown in the following equation

$$y = f[C; E(C; v); u] \quad (2)$$

According to Roemer, realizing an equality of opportunities requires that $F(y/C) = F(y)$ which means simultaneously that no circumstance variable should have a direct causal impact on variable y ($\partial f(C, E, u)/\partial C = 0$), each effort variable should be distributed independently from all circumstances $G(y/C) = G(y)$. In addition, random factors and luck are independent from circumstances $H(y/C) = H(y)$ where all the three functions F , G and H denote cumulative distributions. Subsequently, an inequality of opportunity occurs when $F(y/C) \neq F(y)$ and the extent of this inequality could be measured by the difference between the two members of the previous inequality. This last inequality has been defined as Roemer's *strong* definition of inequality of opportunity in several recent papers, including Bourguignon et al. (2007), Ferreira and Gignoux (2008) and Lefranc et al. (2008).

3. Human Opportunity Index

To test Roemer's theory of inequality empirically, most studies has developed on measuring inequality of opportunity in practice. Numerous methods have recently been suggested, founded in the basic definitions of inequality in Sen (1976), Roemer (1993/1998) and Van de Gaer (1993). These include Bourguignon et al. (2007) and Checchi and Peragine (2010). In this respect, a new index (HOI) has been developed although these studies differ in how to quantify inequality of opportunities. This index is considered a composite measure used to assess the inequality of opportunity in basic services (education and housing services). It focuses particularly on coverage and inequality of access to such services among children for many reasons. Unlike adults, children generally do not have the ability access these main goods by themselves; so access can be considered in the case of children as *opportunity* that depends strongly on their family's circumstances. Besides, interventions for eradication of inequality between subgroups early in the lifecycle of an individual (in children) are considerably more cost effective and pertinent than interventions done later in life.

In this study we define main opportunities as a subset of basic goods and services for all people not only for children. Then, basic opportunities variables related to education (primary school attendance among children aged 6–11 years and secondary school attendance among children aged 12–17 years) and housing conditions (access to clean water, sanitation, and electricity) are used to measure the degree of inequality in the country. In the literature, there is some global consensus on these basic services like the consensus regarding the Millennium Development Goals (MDGs) but other basic opportunities can be added to refine inequality analysis if the relevant data is available.

From political and social points of view, the universal provision of main opportunities is a legitimate and realistic social goal for both long and short-term strategies. For this reason, an increase in coverage of a basic service at the national level is required to improve the HOI index. Nevertheless, such an increase in coverage must be biased towards a deprived group (for example, illiterate or poor people), to increase the index more than proportionally.

4. Methodology and Data Sources

4.1 Methodology for calculating the HOI

Similarly to the methodology commonly used to build the HOI index described by Bourguignon et al. (2007) and Ferreira and Gignoux (2011), we pursue the same steps with some improvements in the calculation of contributions of circumstances variables to inequality of opportunity.

The dissimilarity index of inequality (the D-index) is estimated through a variety of parametric, nonparametric, or semi-parametric procedures. In some applications, authors impose separability restrictions, in others studies they adopt the interactions hypothesis. However, in all cases, the same procedure is applied to calculate the final HOI. In this study, the choice was a separable logistic model.

Given a random sample of the Tunisian population, with information on whether person i had access to a given opportunity (water access, sanitation, education...), and a vector of variables X_i indicating various circumstances like gender, habitat, and per capita expenditure. Then, for each HOI (housing and education), we first estimate a separable logistic model on whether the i th child benefits from access to a given key good or service as a linear function of his or her circumstances. The specification is selected as follows: logarithmic for real per capita expenditure, and categorical for most of the rest variables. At the end of this step we obtain the coefficient estimates from the logistic regressions. Given these coefficient, we estimate, as follows, for each child in the sample the predicted probability of access to the key good or service (\hat{p}_i), based on the predicted relationship ($\hat{\beta}_j$) and exogenous circumstances x_{ji} :

$$\hat{p}_i = \frac{\exp(\hat{\beta}_0 + \sum_{j=1}^k x_{ji} \hat{\beta}_j)}{1 + \exp(\hat{\beta}_0 + \sum_{j=1}^k x_{ji} \hat{\beta}_j)} \quad (3)$$

Second, we compute the overall coverage rate C which is the proportion of the population with access to a given opportunity using the following formula:

$$C = \sum_{i=1}^n w_i \hat{p}_i \quad (4)$$

Where $w_i = \frac{1}{n}$ and n is the size of sample considered.

Then, we compute the D-index (D) as follows:

$$\hat{D} = \frac{1}{2\hat{C}} \sum_{i=1}^n w_i |\hat{p}_i - C| \quad (5)$$

After calculating the penalty which is equal to $P = C \times \hat{D}$, we get the final formula of the HOI for each service or outcome:

$$HOI = C - P \quad (6)$$

The D-index defined in Equation (5), also known as the relative mean deviation, evaluates the sum of all circumstances that contribute to inequality of opportunity. Measuring the impact of each individual circumstance variable would be more helpful to policymakers than assessing the total impact of all circumstance variables. The purpose of determining these individual contributions is to recognize circumstance variables that influence greatly the inequality of opportunity for each service or outcome. Below we present in details a method of calculating these relative contributions.

The ratio of the odds of $z_i = 1$ (access to service) against $z_i = 0$ (no access) is defined as:

$y_i = \frac{p_i}{1 - p_i}$; using Equation (3) above, the maximum likelihood estimation of odd ratio can be

written as follows:

$$\ln(\hat{y}_i) = \hat{\beta}_0 + \sum_{j=1}^k x_{ji} \hat{\beta}_j \quad (7)$$

Where $\hat{\beta}_j$ is the maximum likelihood estimate of the coefficient β_j (see Equation 3).

As defined above, y_i is a monotonically increasing function of p_i ; thus the variation of proportion p_i will be equivalent to variation of y_i . Similarly, inequality of \hat{y}_i which is defined previously as the measure of inequality explained by circumstance variables will be equivalent to inequality of \hat{p}_i . Following Field (2003) and Son (2013) we take the variance of both sides in the previous Equation (7) to get the following equation:

$$\sigma^2(\ln(\hat{y}_i)) = \sum_{j=1}^k \hat{\beta}_j^2 \text{cov}(x_{ji}, \ln(y_i)) \quad (8)$$

According to this equation, inequality of opportunity as defined above can be decomposed in terms of contribution of each individual circumstance variable. Therefore, to obtain the percentage contribution of the j th circumstance variable to the total inequality of opportunity, we divide the two sides of Equation (8) by $\sigma^2(\ln(\hat{y}_i))$ as follows:

$$Co_j = 100 \times \frac{\hat{\beta}_j^2 \text{cov}(x_{ji}, \ln(y_i))}{\sigma^2(\ln(\hat{y}_i))} \quad (9)$$

where Co_j is the percentage of contribution of the j th circumstance variable.

4.2 The data

We use data from the 2005 National Survey on Households' Budget, Consumption and Standard of Living conducted by the INS (National Statistical Institute of Tunisia).³ The 2005 survey was based initially on a random sample of 13,392 households representing 0.61% of total country households (61 surveyed households for every 10,000 households). It is a representative sample distributed across 1,116 districts at the national level, for both urban and rural areas, for the twenty four governorates and for the seven economic regions of the country (Great Tunis, North-East, North-West, Middle-East, Middle-West, South-East and South-West). The 13,392 households were drawn using a two stages stratified random sampling in each governorate. In the first stage a sample of primary units (district) is drawn with probability proportional to their size (PPS) in number of households. The district was defined by the General Census of Population 2004 as a geographic area that contains 70 households on average. In the second stage of selection, 12 households were selected per primary district (sampled district). A second sample of 12 households was selected to be used as a substitute sample if the interviewer failed to get contact with the originally selected household. During the 2005 survey, 12,318 out of the 13,992 households were successfully interviewed, yielding a response rate of 92%. Table 1 shows the distribution of districts and households sampled by regions.

The technical methodology outlined above is applied to the seven economic regions in Tunisia with a particular focus on inequality of opportunity that is related to basic education and infrastructure. The analysis includes five outcome variables: primary school attendance among children aged 6–11 years; secondary school attendance among children aged 12–17 years; access to electricity; access to safe water; and access to sanitation. The circumstance variables

³ The 2005 National Survey on Households' Budget, Consumption and Standard of Living can be downloaded from the National Institute of Statistics (www.ins.nat.tn) or from the Economic Research Forum (ERF) open access micro data (www.erfdportal.com).

used in our analysis are gender (0 if female and 1 if male); residence area of household (1 if urban and 0 if rural); education of household head (1 if the household head has secondary or higher education level and 0 otherwise); per capita household expenditure (in Tunisian Dinars (TD)), age of household head (in year); gender of household head (0 if female and 1 if male); and household size. Table 2 shows the descriptive statistics of the circumstance variables used in the estimation of the logit model.

5. Empirical Analysis

In this section, the methodology outlined above is applied to the seven regions in Tunisia in order to assess the inequality of various services related to basic education (primary school attendance among children aged 6-11 years and secondary school attendance among children aged 12-17 years) and necessary infrastructure (access to safe water, access to sanitation, and access to electricity). A set of circumstance variables is used to calculate the D-index and the HOI such as gender, location of household (urban or rural area), education level of the household head, per capita household expenditure⁴, household size, age and gender of household head. These circumstance variables are related principally to the family's socioeconomic and demographic background which lies beyond the control of the individuals.

5.1 Inequality of opportunity in basic education

As indicated in figure 1, the primary school attendance among children aged 6-11 years is not highly variable across regions in Tunisia. The high HOI value for primary education is in the Southeastern region where 84.82% of primary school services are available and equitably distributed which means that fewer families in this region do not lead their children to primary school. On the contrary, the middle western region has the lowest score (76.01%), but not too small compared to the highest score, which means that only three quarters of the total primary services are available and distributed equitably among children. This can be explained by socioeconomic difficulties such as poverty, unemployment, and lack of infrastructure⁵ that faces families in this region. This inequality in primary school attendance has persisted in this zone despite the efforts of governmental and non-governmental organizations (NGOs) to spread education and eradicate illiteracy.

The small range of variation of the primary education HOI score outlined in figure 1 is due to two main causes. Firstly, many primary education schools have been recently built everywhere, particularly in unprivileged areas, which means that most children can go to the nearest school in a short time. Moreover, in Tunisia like some others North African countries, parents who don't lead their children to primary school could be legally sanctioned.

Comparing primary education results to secondary ones (figures 1 and 2), we find that children aged 12-17 years, across the seven regions, have lower levels of equitably allocated secondary education services than their younger cohorts. More than half of total secondary educational opportunities are inequitably distributed in the whole country as the average score is 50%. As shown in figure 2, the HOI for such secondary school attendance varies from a high of 54.78% for the Southwestern region to a low of 37.64% for the Northeastern part. These results imply that families in all regions, particularly families in central regions, face more difficulties in keeping their children in secondary school compared to families in more urbanized regions like Great Tunis.

Moreover, we observe in central regions that the rate of secondary school attendance is lower than the rate of primary school attendance. To explain these expected findings, we should observe the opportunity costs of sending children to school which are higher for the secondary than for the primary level. In this region, characterized by a low urbanization rate, the majority

⁴ This index is used as an approximate indicator of a household's living standard.

⁵ This region particularly the governorate of Sidi Bouzid was the bed of the Tunisian revolution.

of secondary education schools are concentrated in cities which means that children from small villages and the countryside must spend a lot of time on the road to reach their schools. A large proportion of these children choose to leave schools and start work at very early age.

To examine the origins of both primary and secondary educational inequality, we estimate the relative contribution, defined in the previous section, of each of the seven circumstance variables to inequality. Tables 3 and 4 show the results of logit estimation for each region.

For primary school attendance, table 3 shows that the only significant contribution is that of household size in Great Tunis; almost 50% of the inequality of opportunity for the primary-school-age children education can be explained by this factor in this region. This suggests the direct association between the household size and primary school attendance. One other circumstance that plays a major role in inequality of opportunity is the area of residence. It contributes largely and frequently to such inequality. For example in the northeastern region, it accounts for more than 66% of total inequality; in the middle western part, its contribution reaches the highest value (90%); and even in the eastern part, this location circumstance influences greatly the primary school attendance (40%) (see table 3 for more details). Thus, we conclude that area of residence, where children live (urban or rural area) contributes mainly whether or not a child aged 6-11 years has fair access to primary education opportunities. In the southwestern region, the main factor is gender; it contributes to more than 50% of the inequality. To interpret this result, we should examine the habits and lore of population living in this region. In Tunisia, it is common knowledge that the southern people, particularly those living in rural zones, are more conservative and don't prefer to send their daughters to school.

For the secondary education, four circumstances significantly influence the inequality of secondary education opportunity as outlined in table 4. The most important is the education of household head; its contribution ranges from 32.2% in northwestern region to roughly 80% in southeast. This implies the strong link between the household head's education and his perception of education in whole the country except the southwestern part. Besides, factors such as per capita household expenditure, gender of household head, urban or rural location (where a child lives) and per capita expenditure are also important circumstances that influence the inequality of secondary education opportunity in Tunisia. For example, in Great Tunis, respectively 8.6%, 17.9%, 40.13% and 26.1% of the inequality is explained by gender, location, education and expenditure, respectively. In the northern governorates, the main contributor is education of household head. Meanwhile, gender contribution is about 10% in the eastern part and 14.8% in the western one. Moreover, in central and southeastern regions of Tunisia, education plays a major role in inequality of secondary education opportunity. It explains more than 50% of inequality in these regions. These findings suggest that education characteristics of the household head have a main role in affecting the capability of a child to improve his or her socioeconomic situation through education. In the Southwestern part of the country, gender is the main factor that influences the inequality of secondary school attendance.

5.2 Inequality of opportunity in housing services

Basic housing services, like access to safe water, sanitation and electricity significantly affect the household's wellbeing. Improving these essential services has a direct impact on the health status and productivity needed for income generation. Compared to the basic education results above, our findings for the HOI for housing services imply that Tunisia faces a great challenge in providing basic infrastructure services. As presented in figures 3, 4 and 5, the three HOIs for access to essential housing services show lower values for all inland regions (the western part) except the southwestern part and a high dispersion across regions. As for access to electricity, almost all regions are connected equitably to the electricity network.

As noted by the high value of HOI in figures 3, 4 and 5, the playing field is level for housing services in Great Tunis and the eastern regions where respectively water, sanitation and

electricity services are available and equitably allocated at the rates of 93.02%, 72.52%, and 99.67% . In contrast, the western regions—the most underprivileged regions in Tunisia— have lower scores (49.14% for water access and 12% for sanitation services show unfair distribution in the middle western region). These results highlight the economic and social disparities between inland and littoral regions due principally to lack of infrastructure and opportunity in inland regions. To explain the main factors behind differences between the two regions we examine below the contribution of each circumstance to inequality of housing services.

Tables 5 and 6 show that the area of residence is the main factor that contributes largely and significantly to inequality of opportunity for both accesses to safe water and sanitation in whole the country. The highest significant contribution to inequality of access to water is that the area of residence is for the middle western region (88.27%), while the lowest contribution is for Great Tunis (58.15%). Similarly, location plays a major role in inequality of sanitation services; the highest contribution is in northwestern part (94.0%) and the lowest is in Great Tunis (67.32%). From these results, it is evident that access to these two housing services depends mainly on location particularly in the western region; whether or not households in this region live in rural or urban zone accounts largely to the inequality of having these services. Unlike for the populations of Great Tunis and the majority of littoral governorates, the government couldn't guarantee a minimum living standard to the population of rural inland regions (western part). A significant percentage in of this population has no access to safe drinking water and sanitation services yet. Even the last improvements in water and sanitation networks in these underprivileged zones have been limited to cities and urban areas.

Comparisons of tables 5 and 6 show that location has greater effect on inequality of access to sanitation than of access to safe water. The main reason of such disparity is that sanitation infrastructures are available only in some cities (urban zones) located principally in Great Tunis and littoral region while the water network has been prolonged remarkably since the dependence to reach many countryside in whole the country. These findings suggest that inequality between littoral regions and inland regions (which contains the large part of rural areas in the country) could be explained by the gap between urban and rural areas in infrastructure and some vital services.

The results of the logit estimation shown in table 5 and table 6 suggest also that opportunity of inequality, driven mainly by location, depends on educational and financial characteristics of household heads. In fact, columns (3) and (4) in table 5 allow us to deduce that the education level of the household head and his/her expenditure contribute more in the eastern part of the country than in the western part in inequality of access to safe water. The two highest contributions are in Great Tunis (12.55% for education and 28.32% for expenditure) and the lowest are respectively in northwestern and middle western regions (5.31% for education and 4.14% for expenditure). Likewise, table 6 indicates that inequality in distribution of sanitation services also depends mainly on education and expenditure in regions with high level of urbanization (littoral) than in inland zones. The main challenges facing these inland regions suffering from a low urbanization rate are the enormous costs of building water and sanitation plants as well as the presence of poverty, illiteracy and unemployment.

Concerning the HOI for electricity, the per capita household expenditure is the main factor that contributes significantly to inequality of opportunity particularly in northern and middle western regions. For instance, 90% is the significant contribution of expenditure in electricity in the middle western region compared to the low value of 3% in northeastern which is the percentage of contribution of the household size to inequality of opportunity (see table 7).

6. Conclusion and Policy Implications

As explained above, the HOI combines, into one single indicator, the absolute level of basic opportunities and how fairly those opportunities are distributed among subgroups in each region. Behind the evident inequality characterizing the region's distribution of development services in Tunisia (access to water, access to sanitation services and educational attainment), there is an even more worrying inequality of development opportunities, or in other words the inequality of chances between classes in the same region. Thus, the problem is not exclusively an equality issue; it is an equity issue too. Such equity implies that personal circumstances over which the person has no control (location, family expenditure, and gender) were irrelevant to individual opportunities principally to children's opportunities. The HOI is an appropriate statistical tool that can aid governments to evaluate this kind of inequality between the various classes in society.

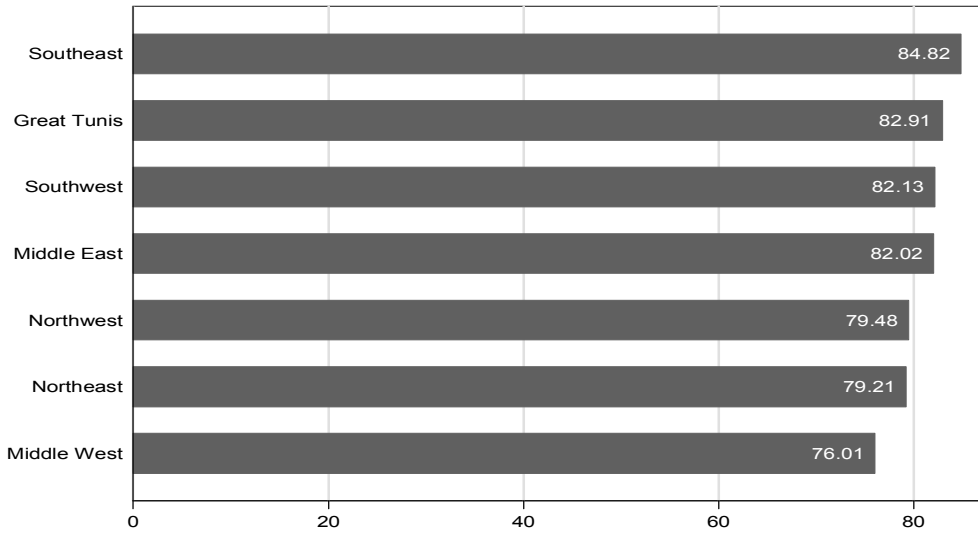
Agitated by increasing inequality between rural and urban areas and between inland and littoral parts of the country, this study set out to investigate the factors that contribute largely to this inequality. A random sample of households was drawn from the North, South, East and West of Tunisia. Four services and seven circumstances were used for the estimation of the HOI score and estimating the contributions of such factors in inequality. The study finds that the significant and main factors that affect inequality of education and housing services are area of residence, gender and expenditure of household head. One recommendation, among other things, is that the government should pursue a program of illiteracy alleviation and economic empowerment for parents to enable them to send their children to school. Another is to reinforce the campaign against gender discrimination in educational opportunities and the development of unprivileged zones concentrated in the inland region particularly in rural areas. Further, it is recommended that policymakers should put more efforts into encouraging investors to create employment opportunities for school dropouts and unemployed people in these disadvantaged regions.

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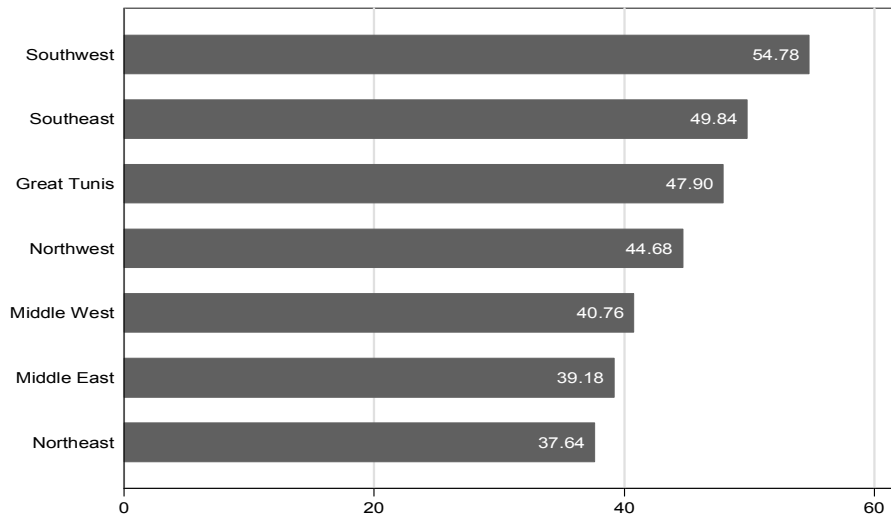
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Figure 1: Human Opportunity Index for Primary Education



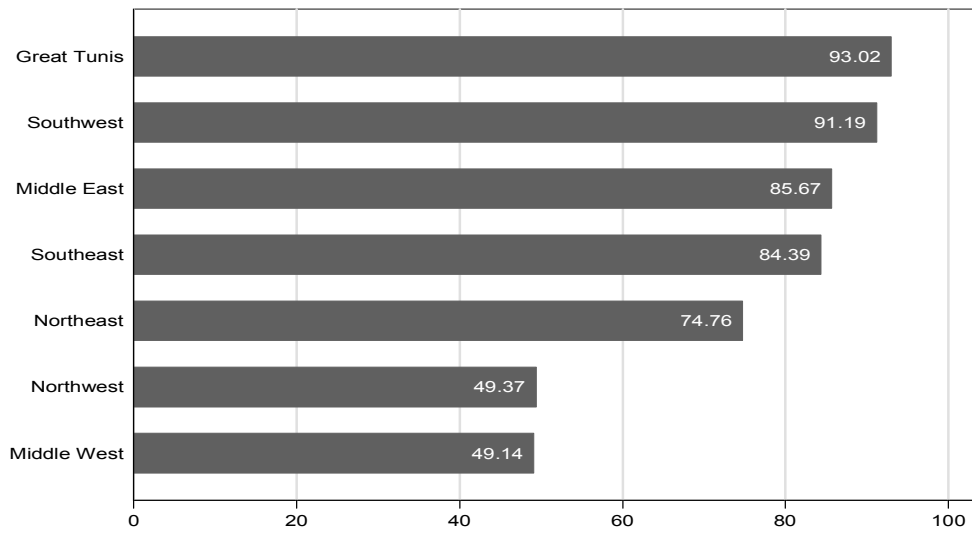
Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Figure 2: Human Opportunity Index for Secondary Education



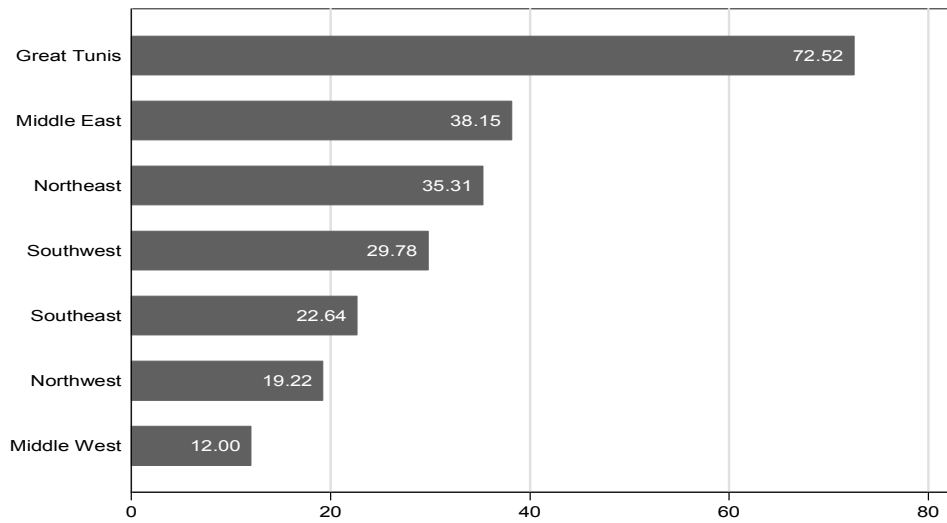
Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Figure 3: Human Opportunity Index for Access to Safe Water



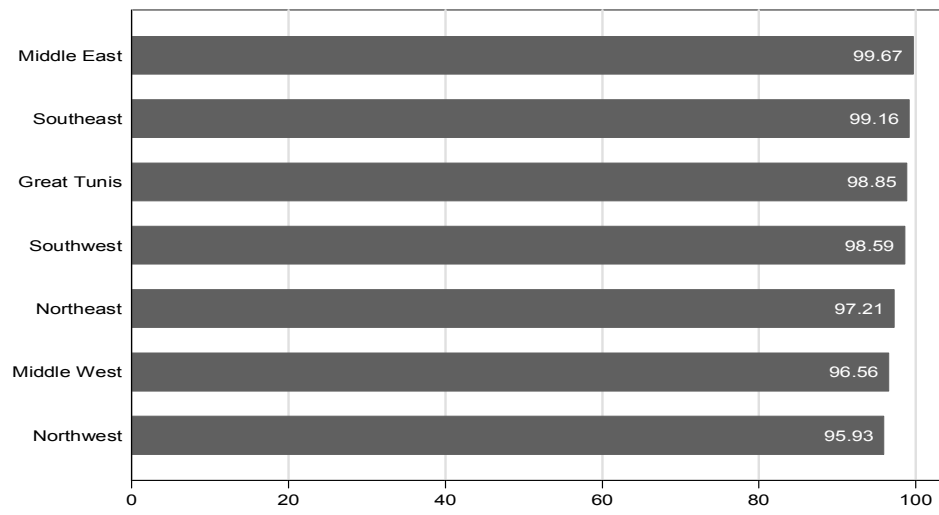
Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Figure 4: Human Opportunity Index for Access to Sanitation



Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Figure 5: Human Opportunity Index for Access to Electricity



Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Table 1: Distribution of Districts and Households Sampled by Regions

Region	Total		Sample size		
	District	Households	District	Households	Household sample percent (%)
Great Tunis	7863	533996	240	2880	0.54
North-East	4446	316199	156	1872	0.59
North-West	3821	269016	144	1728	0.64
Centre-East	7379	503248	216	2592	0.52
Centre-West	3871	264142	144	1728	0.65
South-East	2711	186278	108	1296	0.7
South-West	1644	112960	108	1296	1.15
Total	31735	2185839	1116	13392	0.61

Source: The Economic Research Forum (ERF): <http://www.erfdataportal.com>, and the National Institute of Statistics-Tunisia (INS).

Table 2: Descriptive Statistics of the Circumstance Variables (by Region)

Region	Gender of Children	Residence Area	Education Level of Household Head	Per Capita Expenditure (TD)	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	51.56	86.62	41.07	2446 (2412) [233-44206]	85.07	4.247 (1.700) [1-12]	53.172 (13.659) [21-97]
North-East	50.98	57.83	24.35	1636 (1403) [159-13683]	86.12	4.399 (1.808) [1-12]	53.263 (14.405) [24-97]
North-West	50.47	37.07	17.44	1538 (1307) [158-22630]	79.11	4.394 (2.071) [1-19]	54.782 (14.915) [23-94]
Middle-East	50.44	72.77	36.04	2241 (2267) [185-54417]	83.06	4.583 (1.882) [1-17]	51.786 (14.292) [21-97]
Middle-West	48.86	34.75	24.75	1293 (1391) [85-24375]	81.06	4.992 (2.295) [1-17]	53.303 (15.475) [19-95]
South-East	47.83	64.65	27.43	2012 (2320) [171-43297]	83.11	5.262 (2.407) [1-18]	52.971 (14.436) [18-96]
South-West	47.64	64.42	26.98	1589 (1518) [161-24615]	78.45	4.950 (2.464) [1-15]	53.356 (14.795) [24-97]
Tunisia	50.13	61.94	29.65	1887 (1963) [85 - 54417]	82.62	4.625 (2.073) [1-25]	53.154 (14.521) [18-97]

Notes: The Table reports the mean, the standard deviation (in parenthesis) and the minimum and maximum values (in brackets) of each quantitative variable. For the dummy variables, we just report the percentage of the reference category.

Table 3: Contribution of Circumstance Variables to Inequality of Opportunity for Primary Education

Region	Gender of Children	Area of Residence	Education Level of Household Head	Per Capita Household Expenditure	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	20.076	15.982	2.547	0.007	6.485	47.421**	7.482
North-East	0.366	66.881***	-0.426	8.678	-0.067	6.250	18.317
North-West	12.529	48.588	19.813	9.311	4.445	-0.072	5.387
Middle East	1.048	40.358*	12.595	9.452	6.017	15.205	15.325
Middle-West	6.290	89.325***	1.817	3.645	-0.295	-1.077	0.295
South-East	24.454	2.220	19.332	-0.753	32.764	6.060	15.922
South-West	52.006***	8.888	8.334	16.772	11.337	0.185	2.477

Notes: * Significant at 10 %; ** significant at 5 %; *** significant at 1 %.

Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Table 4: Contribution of Circumstance Variables to Inequality of Opportunity for Secondary Education

Region	Gender of Children	Area of Residence	Education Level of Household Head	Per Capita Household Expenditure	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	8.606***	17.885***	40.132***	26.089***	0.426	4.943	1.920
North-East	9.943**	5.151	56.213***	27.337***	0.746	0.699	-0.088
North-West	14.792***	19.977***	32.206***	23.495***	-0.012	9.635*	-0.091
Middle East	12.854***	23.428***	52.378***	8.177	-0.471	2.746	0.889
Middle-West	4.969	12.436	45.716***	26.748**	3.138	6.089	0.903
South-East	11.687**	1.118	79.681***	8.727	-0.486	-0.231	-0.497
South-West	36.660***	0.663	1.420	43.328***	1.668	0.480	15.781

Notes: * Significant at 10 %; ** significant at 5 %; *** significant at 1 %.

Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Table 5: Contribution of Circumstance Variables to Inequality of Opportunity for Access To Water

Region	Area of Residence	Education Level of Household Head	Per Capita Household Expenditure	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	58.148***	12.556**	28.317***	0.019	0.922	0.035
North-East	61.361***	11.939***	25.650***	-0.012	0.868	0.192
North-West	84.321***	5.311***	9.266***	0.752***	0.305	0.042
Middle East	77.572***	12.160***	10.564***	0.176	-0.478	0.003
Middle-West	88.273***	5.428***	4.136*	0.063	2.009**	0.089
South-East	70.358***	10.201*	19.515***	0.438	-0.717	0.202
South-West	73.336***	-1.255	27.724	1.508	-1.728	0.413

Notes: * Significant at 10 %; ** significant at 5 %; *** significant at 1 %.

Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Table 6: Contribution of Circumstance Variables to Inequality of Opportunity for Access to Sanitation

Region	Area of Residence	Education Level of Household Head	Per Capita Household Expenditure	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	67.319***	9.497***	16.762***	1.144	4.058**	1.217**
North-East	86.941***	3.642**	6.873***	1.378**	1.044	0.119
North-West	94.075***	2.962*	0.313	0.002	2.542**	0.104
Middle East	89.919***	3.986***	6.369***	-0.170	-0.202	0.097
Middle-West	89.157***	4.588**	5.893**	0.153	0.178	0.029
South-East	89.185***	6.331***	3.107	0.241	1.245	-0.111
South-West	85.863***	-0.498	12.143***	0.109**	2.425*	-0.041

Notes: * Significant at 10 %; ** significant at 5 %; *** significant at 1 %.

Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.

Table 7: Contribution of Circumstance Variables to Inequality of Opportunity for Electricity

Region	Area of Residence	Education Level of Household Head	Per Capita Household Expenditure	Gender of Household Head	Household Size	Age of Household Head
Great Tunis	31.320	13.292	52.834	0.436	1.855	0.258
North-East	22.133	12.677	59.772**	0.455	2.985*	1.970
North-West	12.531	7.702	77.728***	1.569	-2.577	3.046
Middle East	1.818	0.000	5.126	0.000	80.714	12.337
Middle-West	7.225	4.336	89.079***	-0.021	-2.337	1.717
South-East	7.701	1.164	56.579	0.000	28.663	5.889
South-West	0.000	0.000	73.556	0.000	16.838	10.054

Notes: * Significant at 10 %; ** significant at 5 %; *** significant at 1 %.

Source: Authors' calculations based on the 2005 National Survey on Households' Budget, Consumption and Standard of Living.