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Abstract

This paper attempts to provide additional light on the structure and dynamics of inequality of opportunity among Tunisian children during the period 2005-2010. The main steps involved in the analysis comprise: estimation of the Human Opportunity Index, assessment of the relative contributions of circumstances, and decomposition of variations in inequality of opportunity in the factors driving them across time and space. The results reveal reasonable and declining levels of inequality in access to some basic services at the national level, but increasing inequalities between regions with Inland area lagging the rest of the country. The number of siblings and parents' education, wealth and location of residence are key factors causing such disparities. Without more inclusive and pro-poor policy actions, there are few chances for children belonging to the less advantaged circumstance groups to spring out of the poverty lived by their parents.

JEL Classification: D63, D31, O18, O55

Keywords: Child development, housing, education, inequality of opportunity, Tunisia.

ملخص

تحاول هذه الورقة تسليط المزيد من الضوء على هيكل وديناميكية عدم تكافؤ الفرص بين الأطفال في تونس خلال الفترة 2005-2010. الخطوات الرئيسية التي تشارك في التحليل تشمل: تقدير مؤشر الفرص الإنسانية، وتقييم المساهمات النسبية من الظروف، والتحلل من الاختلافات في عدم تكافؤ الفرص في العوامل التي تدفع اليها عبر الزمان والمكان. وتكشف النتائج وجود مستويات معقولة وتراجع في عدم المساواة في الحصول على بعض الخدمات الأساسية على المستوى الوطني، ولكن تزداد عدم تكافؤ الفرص بين المناطق مع المنطقة الداخلية المتخلفة عن بقية البلاد. عدد الأشقاء والآباء والتعليم، والثروة ومكان الإقامة من العوامل الرئيسية المسببة لهذه الفوارق. دون إجراءات السياسة الأكثر شمولا ومناصرة للفقراء، هناك فرص قليلة للأطفال المنتمين إلى الجماعات الأقل حظا للخروج من الفقر الذي عاش فيه والديهم من قبل.

1. Introduction

Tunisia has been considered for a long period as a model of economic performance in Africa and the Arab world, with notable economic growth and remarkable resilience to external shocks and crisis. Yet these accomplishments have been eclipsed by the slow response of poverty and inequality to such growing economy. During the period 2000-2010[1], poverty rate decreased nearly by 50% (Bibi, Castel, & Mejia, 2011). Despite this remarkable decline, poverty in Tunisia remains unacceptably high compared to countries from the two sides of the Mediterranean. During the same period, while stable GDP growth at an annualized rate of approximately 3.5% has occurred for over the decade (2000-2010), the poverty rate has remained stagnant at around 15% until the "Jasmine" revolution has occurred in 2011, and started increasing recently, albeit at a slow pace.

Inequality, in Tunisia and in others countries, is no longer regarded as a key prerequisite for growth, but a twin blow to prospects for alleviating poverty, entailing less economic growth and less pro-poor growth (Ravallion, 1997; Chambers & Krause, 2010; UNDP, 2013). The wellbeing cost of inequality is expected to be even higher associated with different inter-group disparities, which imply intergenerational transmission of inequities and self-perpetuation of poverty, generating social tensions and conflicts in a society (Stewart & Langer, 2007; Kabeer, 2010). Rural–urban and regional disparities, in certain cases, may lead to social and economic instability as happened recently in Tunisia in 2008 and 2011. Such instability may weaken popular support for reforms toward market-oriented and private sector-led economy, hindering the process of economic renovation and development (Hassine & Zeufack, 2015).

Generally, the concerns for equity and social justice are about inequality of outcomes, with social inequalities often assessed by investigating the level of income or consumption inequality. Yet, inequality of outcomes is regarded as a mixture of inequality of effort and inequality of opportunity. Then strategies and policies for directly equalling outcomes may come at the cost of discouragement of people to invest and innovate. The differentiation between inequality of opportunities (chances) and inequality of outcomes can be specifically useful for public policy. Indeed, equality of opportunity is not only basically essential, but also an important precondition critical for prosperous and stable society. It is argued that equality of opportunity view, which is at the heart of the inclusive growth concept, is founded on the distinction between circumstances that include the lack of, or unequal access to, the high-quality jobs and public services to which every citizen is meant to have equal access. Inequality of opportunity originating from disparities in circumstances is broadly regarded unfair and meriting of attention from policy makers and scholars. As argued by Roemer (1998, 2013, 2014), Bourguignon, Ferreira, and Walton (2007), and Ferreira and Gignoux (2011) lack of access to basic services and resources deprive large parts of society of their capabilities. Such inequality in opportunity may discourage individuals to take a greater effort and induce then wasted productive potential.

A great part of the literature reveals that the risks to human and cognitive development are not homogeneously distributed over the life-cycle. They are typically higher in earlier stages of life (childhood), with considerable long-term and occasionally irreversible consequences. In Tunisia, as elsewhere, many of the critical inputs for early childhood development, such as early education and access to safe water and sanitation are unevenly distributed among children from different regions. For instance, Tunisia's children and youth, that represent more than 25% the country´s population (UNPD, 2013), face a lot of problems, such as poverty, illiteracy and health issues; and the gap has enlarged during the recent decade. The uneven distribution of basic housing services and education opportunities contributes consecutively to inequality

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[1] In 2000, the Poverty headcount ratio at national poverty line (% of population) in Tunisia was 32.4%; in 2010, it decreased to 15.5%.

in desirable early childhood development outcomes, and, as such, plays a key role in inequality later in life (de Barros, 2009). Following this, further consideration should be accorded to the important role played by circumstances for which child should not be held responsible in tackling inequality of opportunities, particularly in Tunisia, where few studies has focused on this issue (Jemmali & Amara, 2015a, 2015b).

Giving the importance of equality of opportunity in poverty alleviation and inclusive development, the current study attempts to analyze the level and the dynamics of these inequalities among Tunisian children using the Human opportunity index (HOI) methodology and data from the 2005 and 2010 National Surveys on Households' Budget, Consumption and Standard of Living conducted by the National Statistical Institute of Tunisia (NSI). The deep analysis of inequality of opportunity in Tunisia, that we aim to do in this study, contributes to the better comprehension of the economic mechanisms underpinning inequality in the country. It informs then policy makers to compensate less fortunate people by alleviating poverty and inequality traps in order to foster growth with more social equity.

In sum, the current study aims to answer to a set of questions: how far a region is from the objective of providing fair and universal access to a set of critical outcomes and services to all? And what's the degree to which each child has an equal opportunity to benefit from those good and services regardless of his or her circumstances at birth, such as gender, place of birth, and family background? And finally is there any improvement in the equality of opportunities and outcomes during the period ranging from 2005 to 2010?

The remainder of the paper is structured as follows: The following section presents a brief literature review of main studies that focus on the inequality of opportunity in the world and more specifically in Tunisia. Section 3 presents the data and empirical methodology used to the assessment and the decomposition of the inequality of opportunities among Tunisian children. Section 4 presents the main results and discussions, while Section 5 concludes the paper with some policy recommendations.

2. Literature Review

There is an extensive literature on poverty and inequality in Tunisia (see for example Ayadi et al. (2001, 2003) and Bibi and Dyclos (2005)). These studies show that there has been a significant reduction in the level of poverty and inequality in Tunisia, and that Western regions, especially rural areas, contribute substantially to overall poverty. These studies are based, however, on a monetary approach using income as the sole indicator of well-being. Ayadi et al (2008) have attempted to consider the non monetary approach of poverty by using a composite asset index as a proxy of household wealth. They constructed a welfare composite index, based on household living conditions drawn from the Demographic and Health Survey (DHS)[2], in order to analyze the poverty trend from a multidimensional perspective. Using the decomposable poverty index (Foster, Greer, Thorbecke (FGT)), the authors have attempted to decompose poverty by area (urban-rural), by region and by sources (water, toilets, education, communication and housing). In addition, little attention was given to assessing inequality in wider sense using new multidimensional measures others than the traditional economic inequality indicators such as Gini and Theil indexes.

The first authors who have focused initially on inequality of opportunities in Tunisia were Jemmali and Amara (2015a, 2015b). Their studies provided the first applications of the known Human Opportunity Index (HOI) aimed to assess the inequality in the distribution of basic services (education and housing services) at a regional scale in Tunisia. In their two studies, they found obviously large and significant disparities, particularly in access to safe water and

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[2] Despite the high quality of information available at the DHS surveys, they do not contain specific information about household expenditures.

sanitation between the East (Littoral) and Western (Inland) areas. Area of Location, financial and educational features of household head, are found as most important circumstances causing such regional inequality. In this regard, it's notable that the two authors have used the same decomposition technique that is the variance decomposition analysis employed by Son (2013) to estimate the contribution of different circumstances in inequality of opportunity. Whereas, Ersado and Aran (2015) have applied, for the case of Egypt, the Shapley value decomposition proposed by Shorrocks (2013) to estimate contributions of different factors. Hassine and Zeufack (2015) who focused in their study on both inequality of outcomes and inequality of opportunities in Tanzania have used the unconditional quantile regression decomposition. In the current study, the Shapley decomposition procedure is applied to estimate the contribution to inequality of each variable based on the concept of Shapely value in cooperative games.

The latter studies of Jemmali and Amara (2015a, 2015b) have used separately the 2005 and 2010 surveys for the estimation of the HOI level without analyzing the extent and the variation of inequality of opportunity between the two years, as is done in the current study. In this vein, Ersado and Aran (2015) have attempted to assess the changes in inequality of opportunity in Egypt during the 2000s and the factoring driving the trend. After estimating the level of HOI for each outcome variable for 2000 and 2008, they decomposed the variation in the index by scale and distribution effects and tried to understand the main drivers of the estimated change over time (Barros et al., 2009) as one of the main properties of the HOI is that changes are additively decomposable. In fact, any improvement in the value of the index can be caused either by an improvement in the coverage rate (scale effect) or a decrease in the index of dissimilarity (distributional effect).

In a previous study, Assaad et al. (2012) investigated the patterns of inequality of opportunity in child health outcomes in Egypt and certain Arab countries and Turkey employing a number of DHS data. They used indicators for stunting or wasting standardized by height and weight of children as outcome variables used. Their main results are: total inequality in Egypt was increasing over time and geography is the main widespread circumstance impacting height and weight of children, followed by demographic variables and parents' education. The existing study differs from Assaad et al. (2012) and the other current studies in that it considers several other outcome variables including access to housing basic services (safe water, sanitation and electricity) as well as educational opportunities (enrollment and attainment).

Inequality of opportunity in education among children has also attracted the attention of researchers. Several cross-country studies that included Egypt, Tunisia and other developing countries, such as Filmer and Pritchett (1999), Filmer (2005), Smits (2007), and Huisman and Smits (2009), found that socioeconomic status is the most important variable affecting access to and achievements in education. Filmer (2005) as well stated that the prevalence of gender gaps in educational enrollment varies considerably by regions across the world. While Al-Qudsi (2003) found that household wealth is the important factor impacting school enrollment. Both studies of Zhao and Glewwe (2010) in China and Tansel (2002) in Turkey attain similar conclusions on the importance of household wealth/income and parents' education status in affecting a child's enrollment in school. Salehi-Isfahani et al. (2012) has focused on inequality of opportunity in education in Egypt, alongside a number of other Middle East and North Africa (MENA) countries, employing the Trends in Mathematics and Science Study data.

3. Data and Methodology

3.1 Data

This study derives its main data from the National Surveys on Households' Budget, Consumption and Standard of Living conducted in 2005 and 2010[3] to measure household consumption expenditures and different standard of living such as access to basic services and educational enrollment and attainment. The samples in the two surveys are nationally representative and include interviews with 13392 households representing respectively 0.61% and 0.55% of total households in the country (i.e. 61 and 55 surveyed household are selected respectively, for every 10000 households). The representative sample is distributed across 1116 districts in both urban and rural areas, belonging to the twenty four governorates and the seven economic regions of the country (Grand Tunis, North East, North West, Center East, Center West, South East and South West) (for more details about the selected samples see Tables 1a and 1b).

The calculations will be made based on key circumstance and outcome variables derived for all children aged under 19 years living in surveyed households, including Parents' education and expenditures, geographic characteristics and access to core basic services. Analysis of educational enrollment (primary and secondary school[4]) and attainment is also carried out for specific age groups. Specifically, the empirical analysis will include, on one hand, seven outcome variables: primary school attendance among children aged 6–11 years; lower secondary school attendance among children aged 12–14 years; higher secondary school attendance among children aged 15–18 years; probability of completing the 6th grade on time; probability of completing the 9th grade on time; access to electricity; regular access to safe water; and access to sanitation facilities. On the other hand, the empirical analysis involves seven key circumstance variables in determining the people's opportunity access. Grouping based on the following circumstances permits us to classify people in terms of least and most advantaged group in the country. The used seven circumstance variables in the current exercise are:

- Region: Grand Tunis, North East, North West, Centre East, Centre West, South East, South West. (7 categories)
- Location: large cities, medium and small cities and rural area. (3 categories)
- Household head's Education: None formal education, Primary/Lower secondary, Secondary, Post secondary or equivalent, University, and Postgraduate. (6 categories)
- Spouse's education: None formal education, Primary/Lower secondary, Secondary, Post secondary or equivalent, University, and Postgraduate. (6 categories)
- Age of Household head: In year. (Continuous variable)
- Gender of Household head: 0 if female and 1 if male. (2 categories)
- Number of siblings aged under 14 years. (Discrete variable)
- Gender of the child: female and male. (2 categories)
- Household consumption per capita. (Continuous variable)

Tables 2a and 2b give a summary of the descriptive statistics of different circumstances variables across different regions for the two years 2005 and 2010.

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[3] The 2005 and 2010 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.erfdataportal.com).

[4] Primary education in Tunisia as in the majority of countries provides children with essential reading, writing, and mathematics skills along with an elementary comprehension of such subjects such as history, geography, natural science, social science, art, and music. While the Secondary education (lower and higher levels) completes the provision of basic education acquired at the primary level, and aiming to lay the foundations for lifelong learning and human development, by providing more subject- or skill-oriented instruction using more specialized and educated teachers.

3.2 Empirical methodology

As mentioned above, the aim of the current study is the estimation and decomposition of the synthetic measure of the inequality of opportunity, the HOI. This index has been first developed and mentioned in the report of the World Bank, (2006). Initially applied to Latin America and the Caribbean (LAC) by de Barro, (2009), it allows us to measure the extent to which individual circumstances (birthplace, wealth, gender,...) influence a child's probability of accessing basic services necessary to succeed in life (timely education, running water or connection to electricity). It's notable that the developed index focuses mainly on coverage and inequality of access to aforementioned services among children for two main reasons. Firstly, unlike adults, children frequently haven't the capacity to access to these main goods by themselves; Thus, access can be considered in the case of children as opportunity that depends strongly on the family's circumstances and other factors. Secondly, interventions for alleviation of inequality between subgroups early in the life-cycle (children) of an individual are noticeably more cost effective and relevant than interventions done later in life. For core basic services like access to safe water and sanitation facilities, an age constraint is included in the estimation of the HOI.

As mentioned above, the HOI combines assessments of both the absolute level of opportunities coverage and how fairly those opportunities are distributed in a society. The first component of the index is aimed to assess the average coverage rate for a considered opportunity that can be easily computed using current household surveys data. While, the second component is aimed to measure the fairness of opportunity.[5] Following De Barros (2009), Son (2013) and Jemmali and Amara (2015a, 2015b), and given the surveyed random samples of the population, a dichotomous variable z_i is created taking a value of 1 if the *ith* child of the considered group has access to the specific opportunity (for instance safe water and sanitation) and takes a value of 0 if he lacks access to this opportunity. It can be simply proved that $E(z_i) = p_i = P(z_i)$, where p_i is the probability that the *ith* child has access to a certain opportunity. It depends on a set of exogenous variables representing the individual, household, and geographic characteristics outside the individual's control (circumstances), such as: gender, parental education, wealth, geographic location and others. Before computing the final index, circumstance groups are created as a set of individual sharing the same set of characteristics. For instance, males living in rural areas in the North-Western region, with non-educated parents and five children in the household, or women, with educated parents and living in rural areas in coastal zones.

Considering the set of predefined k circumstance variables $x_{i1}, x_{i2}, ..., x_{ik}$, the probability p_i for each child can be estimated by means of a logit model as follows

$$p_i = \frac{e^{(\beta_0 + \sum_{j=1}^{k} \beta_j x_{ij})}}{1 + e^{(\beta_0 + \sum_{j=1}^{k} \beta_j x_{ij})}} \tag{1}$$

The parameters β_j of the logit model can be estimated using the maximum likelihood method. The obtained maximum likelihood estimate, $\hat{p}_i$, provides an accurate estimate of the probability of access to a considered opportunity depending on aforementioned circumstance variables. Then, any difference in estimated probability between circumstances-groups will be interpreted as an inequality of opportunities that can be explained by the circumstance variables. After estimating such probabilities, a Dissimilarity index that gives a measure of the dissimilarity of access rates to a given service, is computed as follows (World Bank, 2006):

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[5] The present section merely gives the basic conceptual method for calculating the Human Opportunities Index. For further details and discussion, refer De Barros (2009) which has a more exhaustive explanation of the procedure for computing the second component of the HOI, the Dissimilarity index (D-index), for estimating inequality of opportunity in access to given services. The methodology used in this section hence follows analogous notations as far as possible in order to retain coherence and comparison.

$$\widehat{D} = \frac{1}{2\bar{p}} \sum_{i=1}^{k} w_i |\hat{p}_i - \bar{p}| \tag{2}$$

Where $\widehat{D}$ is the estimated relative mean deviation, w_i is the population weight associated to a considered opportunity and $\bar{p}$, called level of coverage, is the average prevalence of access to a service in the surveyed sample, calculated using the following formula:

$$\bar{p} = \sum_{i=1}^{n} w_i \hat{p}_i \tag{3}$$

The weight w_i is equal to $1/n$ where n is the size of the selected sample.

The D-index is used to assess the degree of inequality of opportunity that can be explained by the different circumstances, and ($E = 1 - D$) is the measure of the equity of opportunity. As defined above, D takes values ranging between 0 and 1 (0 to 100 in percentage terms). $D = 0$ means that every individual in the society benefits from the same opportunities, while $D = 1$ means that merely one individual in the society benefits from all opportunities.

After estimating the two components: average access to opportunities ($\bar{p}$) and D-index (D), the HOI is computed as follows:

$$HOI = \bar{p}(1 - D) \tag{4}$$

Since $0 \leq D \leq 1$, HOI will be necessarily less than or equal to the level of coverage ($\bar{p}$), which implies that there will be essentially loss of average opportunities available to the whole society. Then, opportunities are generally not uniformly enjoyed by all people in the considered society. The composite index can be accordingly identified as an inequality-adjusted coverage rate and every policymaker should seek to maximize the HOI by improving total opportunity coverage, boosting equity of opportunity or both coverage and equity.

After computing the HOI level for each outcome variable for the two years 2005 and 2010, it is promising to decompose the variation of the index by scale and distribution (equalization) effects in order to recognize the main sources of the estimated variation over time (de Barros, 2009). The first effect can be defined as a change in the overall coverage for the entire population without any changes in inequality while the second one is defined as a change in the equality of access to the opportunity between the circumstance groups. One of the main properties of the constructed HOI is that the variations are additively decomposable. Then, any improvement (increase) in the index value can be attributed either to a rise in the coverage rate (scale effect) or a decrease in the index of inequality of opportunity, D (equalization effect). Accordingly, the dynamic of the index HOI between 2005 and 2010 can be decomposed into scale and distributional effects for each of the outcome variable as:

▪ Variation in HOI value:
$$\Delta \text{HOI} = \text{HOI}^{2010} - \text{HOI}^{2005} = \Delta \bar{p} + \Delta D \tag{5}$$

▪ Scale effect:
$$\Delta \bar{p} = \bar{p}^{2010}(1 - D^{2005}) - \bar{p}^{2005}(1 - D^{2005}) \tag{6}$$

▪ Distributional effect:
$$\Delta D = \bar{p}^{2010}(1 - D^{2010}) - \bar{p}^{2010}(1 - D^{2005}) \tag{7}$$

Furthermore, we seek in this study to measure the contributions of different circumstantial variables in inequality of opportunity using the decomposition procedure proposed by Shorrocks (2013); this method is founded mainly on the concept of Shapley value in cooperative games. The Shapley decomposition will allow us to assess more accurately the marginal contribution of each individual circumstance (such as gender, education, location, family features) to inequality in access to basic services. It consists of estimating the marginal effect in the HOI, for the two years, of adding or removing each inequality contributor (circumstance) in a specified sequence of elimination (Betti, 2008; Shorrocks, 2013). The

procedure entails computing the marginal impact of each circumstance as all these circumstances are eliminated in succession, and afterward averaging the obtained marginal effects over all the possible elimination sequences. The contribution of all circumstances provides an accurate and additive decomposition between group inequalities (dissimilarity index). The developed formula is properly the same than the Shapley value used in a cooperative game. In order to exemplify the utilization of the procedure, it will be applied to the five outcomes to estimate the relative contributions of each circumstance to the observed variance of different outcomes.

Pursuing Barros et al. (2009), inequality of opportunity depends on the dissimilarity index (D) as defined in Equation 5. The value of dissimilarity index D (and therefore HOI) is a function of a set of circumstances that depend on the distribution of these factors in the society. Furthermore, they have the main property that adding more circumstances usually raises the value of the D-index. The impact of adding a circumstance A is given then as follows:

$$D_A = \sum_{S \subseteq N \setminus \{A\}} \frac{|s|!(n-|s|-1)!}{n!} [D(S \cup \{A\}) - D(S)] \tag{8}$$

Where N is the set of all the n circumstances; and S is the subset of N circumstances obtained after eliminating the circumstance A (i.e. S does not contain the particular circumstance). D(S) is the dissimilarity index estimated with the set of circumstances S without the circumstance A and $D(S \cup \{A\})$ is the dissimilarity index estimate with set of circumstances S and the circumstance A. Then, using the shapely procedure, the contribution of the omitted circumstance A to the dissimilarity index can be defined as follows:

$$M_A = \frac{D_A}{D(N)}$$

Where $\sum_{i \in N} M_i = 1$. This is a critical property satisfied by the Shapley decomposition, which means that the sum of the contributions of all circumstances to the dissimilarity index adds up to 100 percent. To assess the marginal effect of each contributor among the seven circumstances on inequality of access to an opportunity, the above procedure on the dissimilarity is applied.

4. Empirical Results

4.1 Circumstances and access to basic services

Before delving into the investigation of inequality of opportunity among Tunisian children, a descriptive analysis of how some aforementioned circumstances beyond the children´s control affect the level of access to basic services. The results of such descriptive analysis are presented at national scale for the two years 2005 and 2010 under each of the two main categories of outcomes: access to housing and basic services and school enrollment. To highlight the impact of certain circumstances, including the location of residence on the distribution of outcomes, the current section presents the contrast in these outcomes between the least and most advantaged children's groups.[6]

4.1.1 Access to housing services

Access to basic infrastructure services (improved drinkable water, sewage facilities and electricity) has considerably expanded in the 2000s, and this expansion has been pro-poor. According to results of 2005 and 2010 surveys, the percentage of children aged less than 19-

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[6] Most and least advantaged groups of children are defined according to circumstances variables. These two groups make up both the two extremes of the set of groups constructed based on circumstances; they account for nearly 3% of the total number of children aged between 0 and 19. The least advantaged group contains children from rural areas, parents (Head and Spouse) with no formal education, in households with more than four children at home, and from families in the poorest quintile class. While the most advantaged group contains children who are from urban area, parents with higher education level, in households with four or less than four children, and from families in the richest quintile class.

year-old living in households benefiting from access to both safe water, sanitation facilities and electricity has risen slightly from 41.94% in 2005 to 49.36% in 2010. Despite the overall pro-poor expansion of access to basic services among children, the rate of such expansion differs across regions. The highest expansion, nearly 13%, is observed in the North East (Grand Tunis and North East) while the lowest level is observed in the North Western region (Fig.1). In the lagging region, only 33.75% of children (0-19), in 2010, lived in households benefitting from access to basic housing services, compared to 29.89% in 2005.

It is remarkable from the Figure 1 that the Centre Western region, have experienced the lowest percentage of access to basic housing services among children during the considered period, five years before the beginning of the recent revolution that took place firstly in this region. The percentage of children in this region with no access to improved water, sanitation facilities and electricity at home has risen a little from about 20.78% to 28.37% during the same period. It's easy then to conclude that the inequalities in access to such basic services are largely due to geographical differences. The remained inequalities are explained by other individual and contextual factors that will be investigated afterward more deeply when looking at the contribution of these circumstances on the inequality of opportunities in access to basic housing services.

4.1.2 Enrollment and educational attainment

On the national scale, the overall likelihood of enrollment has dropped slightly from 94.06% to 93.41% in primary education (ages 6-11), and has risen from 59.21% to 66.59% in lower secondary education (ages 12-14), and from 45.65% to 46.53% in higher secondary education during the considered period. While the educational attainment rates: completing the 6th grade on time and completing the 9th grade on time, used in this study as proxies for the measure of the quality of education, have respectively dropped a little from 35.85% and 45.81% in 2005 to 32.56% and 45.37% in 2010.

To shed a light on the impact of certain circumstances on educational opportunities assessed by the enrollment and attainment indicators, the Fig.2 presents the distribution of such measures across the two extreme groups for the two years 2005 and 2010. The figure shows that the enrollment gap in primary school between least and most advantaged circumstance groups is slightly narrowed during the considered period, indicating a slightly pro-poor expansion of enrollment in basic education. While the enrollment gap in secondary school (lower and higher level) is remained high for the two years without considerable improvement in the enrollment rate for the two groups. The highest gap between the two groups of children, observed in the higher secondary school, is dropped slightly from 65.89% in 2005 to 59.86% in 2010. Such large enrollment gap could be considered as an argument of the obvious impact of geographical and family characteristics on access to secondary education in the country.

Concerning the educational attainment opportunities, assessed by the probabilities of completing the two levels 6th and 9th grade on time, the figure is not different compared to enrollment opportunities in secondary school. The gap between the least and most advantaged groups in completing the primary cycle on time is narrowed slightly from 16.35 percent point in 2005 to 12.84 in 2010. While the gap in completing the basic education on time between the two groups is remained high and slightly dropped from 58.78 percent point to 49.72. Globally, the Fig.2 reveals that there is no substantial change during the last five years before the 2011 revolution and the disparity between the two groups remained high particularly in enrollment and attainment in secondary education.

4.2 Inequality of opportunity in access to basic services

After the preliminary analysis of access to basic services across the different regions and their trends during the period 2005-2010 the current section is devoted to the assessment and the decomposition of inequality of opportunity in access to these services.

4.2.1 Inequality of opportunity in access to housing services

Figure 3 presents the estimated coverage, equality of opportunity index (1-Dissimilarity index) and the different HOI levels of the three basic housing services (water, electricity and sewage) for children aged less than 19 years old. A single summary indicator measuring the accessibility of all services and facilities for children is added to previous indicators to assess exposure of those children to multiple risk factors; it takes 1 if the considered child could access regularly to drinkable water, sanitation facilities and electricity and 0 if not.

The Figure 3 shows at the national scale greater level of both coverage and equality index, and accordingly higher level of HOI index, of access to electricity for the two years than compared to others housing services. The high level of HOI, more than 90%, indicates that such service is provided more equitably to the majority of households regardless of their circumstances living. Regular access to improved drinkable water source shows also high HOI level, more than 60%, associated with high coverage level and low dissimilarity index while access to sanitation facilities shows the lowest level of HOI (less than 40%) and coverage indexes and the highest value of dissimilarity index (Fig.3).

In addition, except for the slight improvement in the coverage (scale effect) and the equality (distributional effect) indexes of sanitation service, which had a positive impact on the HOI value (Fig.3), the decomposition of the changes in inequality of opportunity between 2005 and 2010 shows that no substantial changes for the housing basic services is observed. However, disparities still remain across circumstances groups, particularly in access to an improved water source and sanitation facilities. The Shapley decomposition results for the two years presented in the Figure 4 reveal that regional variables such as location (Urban or rural areas) and region (seven different regions) explain all the lion's share of the variations in access to improved water and sanitation facilities. Indeed, these two regional variables explain more than 60% of the variation in access to these services; the remaining variation, about the third of the total variation, is explained by the rest of explanatory factors (Fig 4).

Giving the importance of regional circumstances in explaining the inequality in access to housing outcomes, the Figure 5 shows the variation of different inequality indices across region and time. This figure reveals a huge gap in the HOI index between regions ranging from 18% to 66% in 2005 and from 11% to 83.61% in 2010, with Centre Western, North Western and South Eastern regions are lagging below the 20%, the lower HOI threshold, and Grand Tunis, the only region above 50%, the upper HOI threshold. Overall, the Figure 5 reveals that inequality of opportunity (water and sanitation) in Inland regions is broadly high than in the Littoral part of the country. In fact, the regional average in Inland has slightly risen from 18% in 2005 to 21% in 2010, while in the Inland region the average has risen from 37% in 2005 to 48% in 2010. Concerning the electricity service, one of the main basic housing services, the majority of regions have practically, attained universal access, while others, such as some rural areas in the Western part of the country (Inland region), show both low coverage and high dissimilarity in the accessibility to such service.

4.2.2 Inequality of educational opportunity

Five main educational indicators are used in the current study to assess inequality of opportunity in access to different schools (Primary, Lower secondary and Higher secondary) and basic quality education. The first three services are linked to enrollment separately for different levels: (a) the probability of enrollment for children in the age group 6-11 years old in primary; (b) the probability of enrollment for children aged between 12 to 14 years old in preparatory level (lower secondary); and (c) the probability of enrollment for children aged between 15 to 18 years old in higher secondary school education. The fourth and fifth indicators are linked to educational attainment: (d) the probability of completion of 6th grade on time to

move from the primary level to the preparatory one; and (e) the probability of completion of the 9th grade on time to move from the basic education to the secondary one.

While the HOI for enrollment in compulsory education remains at the same high level, more than 92%, during the considered period, a slight increase of the HOI for enrollment in non-compulsory education (secondary education) is observed over the same period, jumping from about 55% to over 62% between 2005 and 2010 (Fig 8a). The improvement in the educational HOI index is due mainly to the proportional improvement in both the level of accessibility to the related educational opportunity and equality in benefiting from this opportunity (Fig.6). Unlike others educational service, the HOI education related to the older age group of (15-18 years old) has dropped slightly from about 41.50% in 2005 to under 40% in 2010 (Fig.8a). This decrease of the HOI is due mainly to a slight decrease of both the coverage (scale effect) and equality (distributional effect) indexes during the considered period (Fig.6).

The HOIs for attainment in completing the 6th and 9th grades have both decreased over the period, indicating a decrease of about 3 percent point in the probability of completing the two grades on time. Using these two indicators as measures of the educational quality, the Fig 6 shows a slight decrease in the quality of primary education due mainly to decrease of both the coverage and equality indexes (negative scale and distributional effects). Besides, a same decrease in the quality of preparatory education due to simultaneous decrease of both the coverage and equality indexes is illustrated in the former figure.

Similarly, to housing services, regional variables (location and region) added to parental education (head's and spouse's education level) and welfare variable are consistently the most important factors that explain a large part of the variation in enrollment and attainment indicators in Tunisia among children. For instance, the "region" circumstance explains alone about 40% of the variation in the enrollment rate in the primary school in 2010, while in 2005 the most important factor that explain variation of the latter outcome is the location (urban or rural) with more than 37% of the total variation. Globally, the regional circumstances combined explain over 46% in 2005 and 48% in 2010 of the total variation of enrollment in primary education. While, the family background variables such as age of head of household, parent's educational attainment, the consumption level of the household and the number of siblings in the family combined explain about half of the variation in enrollment rates, over 80% of the variation in the probability of completion of 6th grade on time and over 50% of the variation in the probability of completion of 9th grade on time. The results of the Shapley decomposition shown in the Fig 7 reveal that parent's background assessed by educational and economic situation of parents have a considerable impact on their children's education achievement during the considered period; it affects both the educational attainment and enrollment in different education levels. This means that years of schooling completed, and educational achievement more generally, vary broadly in the society by educational and economic family background.

Giving the important contributions of the regional variables in the distribution of educational opportunities, Fig 8a and 8b show the variation of enrollment and attainment HOI indexes across different regions. The figures show that HOI for enrollment in compulsory primary education remained over 90% in all regions for the two years, indicating that the majority of children from different regions have not a problem with access to such education. While access to preparatory school shows significant disparities between Littoral and Inland regions and a slight improvement during the considered period, the HOI for enrollment in secondary school shows a less disparity between Littoral and Inland regions and a decrease of the HOI level for about all regions (Fig 8a).

The same figure is observed for the two attainment variables, the probabilities of completing the 6th and 9th grade on time. The HOI of such two variables are decreased in all regions

between the two years and shows a significant disparity between some Inland and Littoral regions. The performance of a few regions diverges broadly when assessing inequality of different opportunities. For instance, the Center Western region has the lowest level of all educational HOI (enrollment and attainment) due to both the less coverage and the high dissimilarity of access to education across children; this region like other in the Western part of the country is very far from universality of access to good quality of education at different levels. While in the other advantaged region such as the Capital and their neighbors (Grand Tunis) children have more opportunity to access to school and benefit from a good quality of education to get all the required grades on time without repeating years.

5. Concluding Remarks and Policy Implications

Concepts like fairness, equity, and justice in the distribution of outcomes are no longer in the realm of philosophers and theorists; rather, they are recently in the forefront of policy design and economic reform. Ensuring children's access to core basic goods and services such as safe drinkable water, sanitation, electricity and quality education are a crucial step towards justice and fairness in a society. Expanding access to these goods and services and equalization of opportunities remains an important policy challenge in the economic development process and public policy discussions, including the Millennium Development Goals initiative. In this respect, the current study is concerned with analyzing the level and trends in equity of distribution of opportunity for basic services in education and infrastructure among Tunisian children during the last quinquennial before the 2011 revolution.

The analysis was carried out mainly using the Human Opportunity Index (HOI) initially developed by the World Bank, to examine both the coverage and distribution of opportunity of an outcome variable such as access to basic housing services, or access to quality education. The methodology was applied empirically using available household data from two surveys carried out by the NIS in 2005 and 2010. The estimated HOI of each outcome measures the total contribution of all circumstance variables to inequality of opportunity. It can be used as a practical diagnostic tool for policy analysis and an appropriate point of reference for gauging progress in the equality of opportunity thanks to its flexibility for application to various circumstances, opportunities, and population groups. From the perspective of policy makers, determining the impact of different individual circumstance variables would be helpful in analyzing binding constraints to affording equitable opportunities to all children across regions. Using the Shapley decomposition method to quantify the relative contributions of these individual circumstance variables to the inequality of opportunity, would be more useful as these individual contributions will help to determine circumstance factor that most affect inequality of opportunity.

The main findings of the study show that Tunisia has experienced a considerable advancement with regards to the availability and access to basic services for children, in some cases with a pro-poor overall effect. In particular, significant improvements have been made in access to sanitation facilities and in the lower secondary enrolment rate. As a result, there has been a substantial decline in inequality of opportunity in the case of these two outcomes over the considered period through both increased coverage (scale effect) and redistribution effects (distributional effect). However, there are areas of persistent and emerging concerns that require urgent interventions, such as educational enrollment and attainment opportunities. Indeed, Tunisia has experienced during the considered period large disparities across different regions in school enrollment specially at the highest level and in education achievement as proxied by completing sixth and ninth grade on time. At the regional scale, wide disparities in access to basic infrastructure persist between the two years, with Inland region, particularly the Center Western region lagging the rest of the country. Geographical circumstances such as the location and region of residence have played the main role in these large disparity in housing services. While, household background features, particularly the number of siblings added to

parents' education and wealth are found as the most important factors that influence children's possibilities of accessing high-secondary education or even attending secondary school.
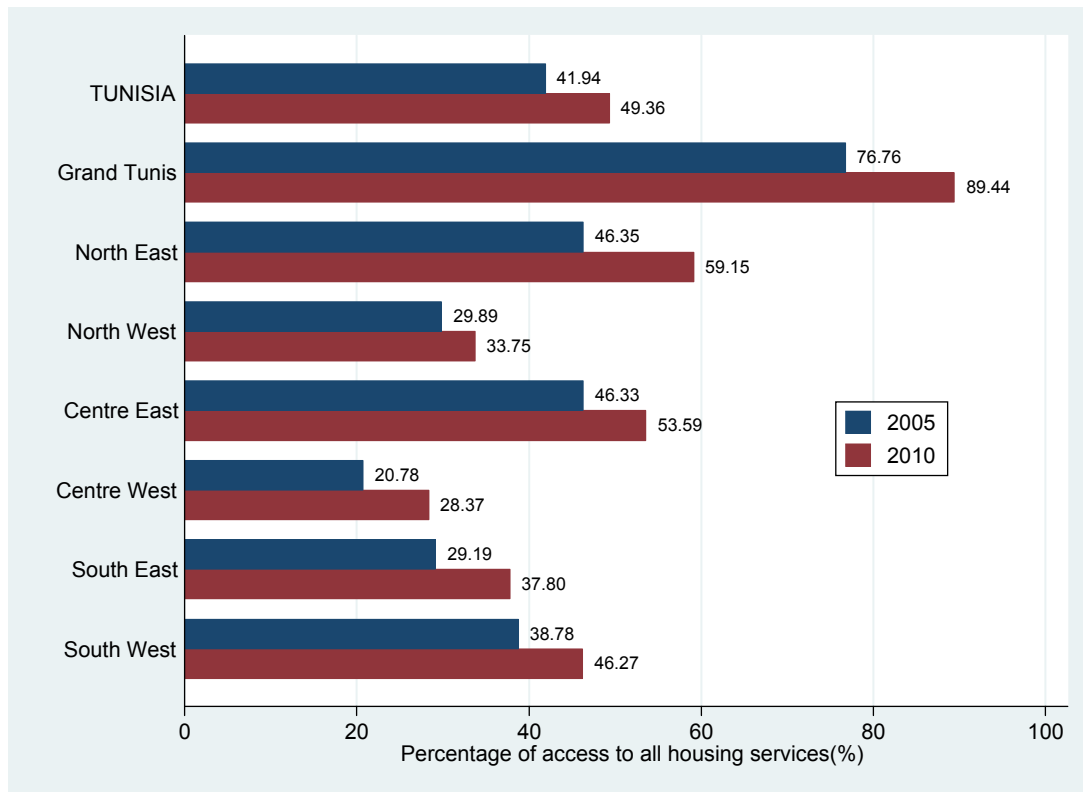
Globally, advances in basic opportunities in the country are encouraged. But these improvements in coverage and distributional considerations differ across regions, particularly between the Inland and the Littoral parts; in some regions, expansion has entailed a significant decline in inequality of opportunity, whereas in others, inequality diminution has been modest. There are some practices, successful policies and experiences that show that coverage can be expanded while emphasizing distributional considerations for housing services and educational policies in developed countries that can be applied and reproduced. Taking into account the main findings of the current study, it is notable that targeted interventions and appropriate investments in favor of the less advantaged circumstance groups may afford the significant potential for enhancing overall equity in housing conditions and schooling among children. In this respect a more inclusive approach and special efforts would be required for those children exposed to multiple risk factors. From a policy perspective, evidence indicates that appropriate actions and policies to equalize opportunity between different classes early in the lifecycle of an individual are considerably more cost effective and successful than any interventions later in life.

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Figure 1: Access to all Basic Housing Services among Different Regions in 2005 and 2010 (%)

Region	2005	2010
TUNISIA	41.94	49.36
Grand Tunis	76.76	89.44
North East	46.35	59.15
North West	29.89	33.75
Centre East	46.33	53.59
Centre West	20.78	28.37
South East	29.19	37.80
South West	38.78	46.27

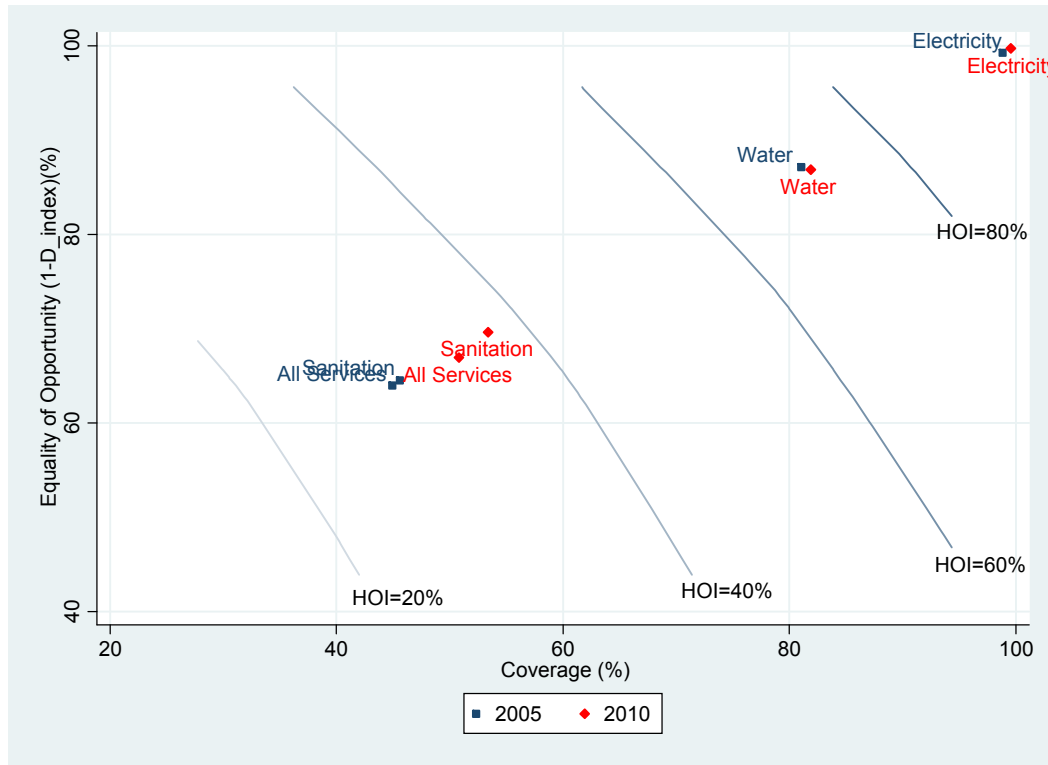Percentage of access to all housing services(%)

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Figure 2: Enrollment and Educational Attainment in 2005 and 2010
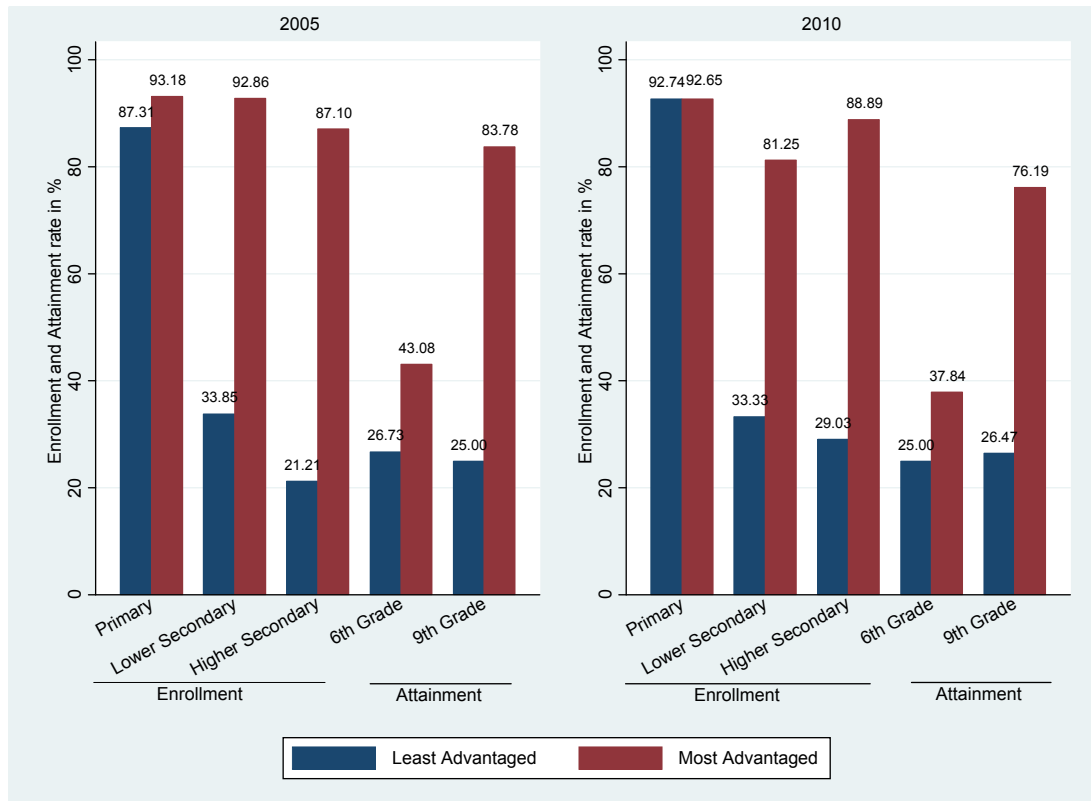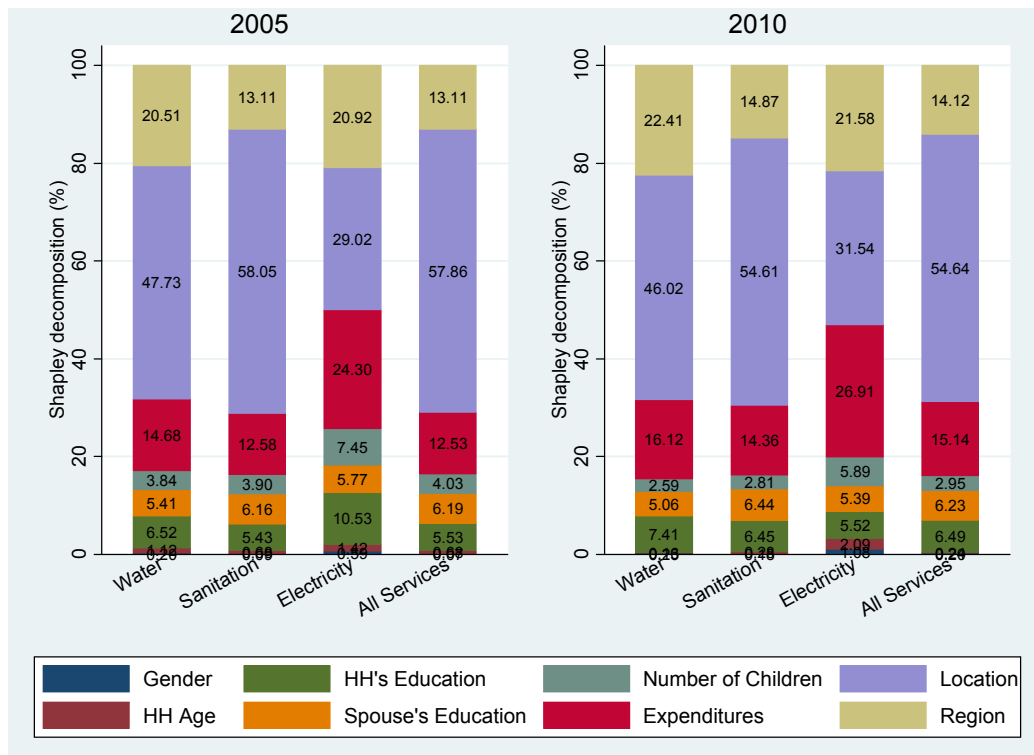

Source: Author's calculation in Tunisia Surveys 2005 and 2010

Figure 3 : Coverage and Equality of Opportunity in Access to Basic Services (2005-2010)

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Figure 4: Shapley Decomposition of Inequality of Housing Opportunities in 2005 and 2010

Source : Author's calculation from Tunisia Surveys 2005 and 2010

Figure 5: Inequality of Opportunity in Access to Housing Services Across Regions in 2005-2010

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Figure 6: Coverage and Equality of Educational Opportunity (2005-2010)
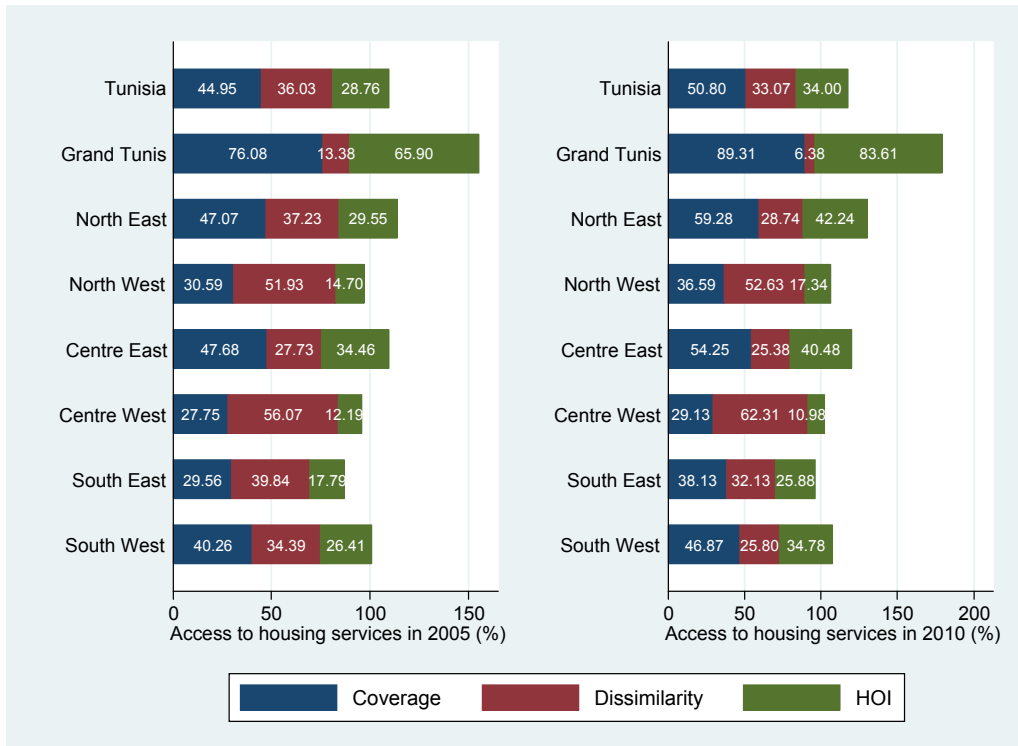

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Figure 7: Shapley Decomposition of the Educational Opportunities in 2005 and 2010

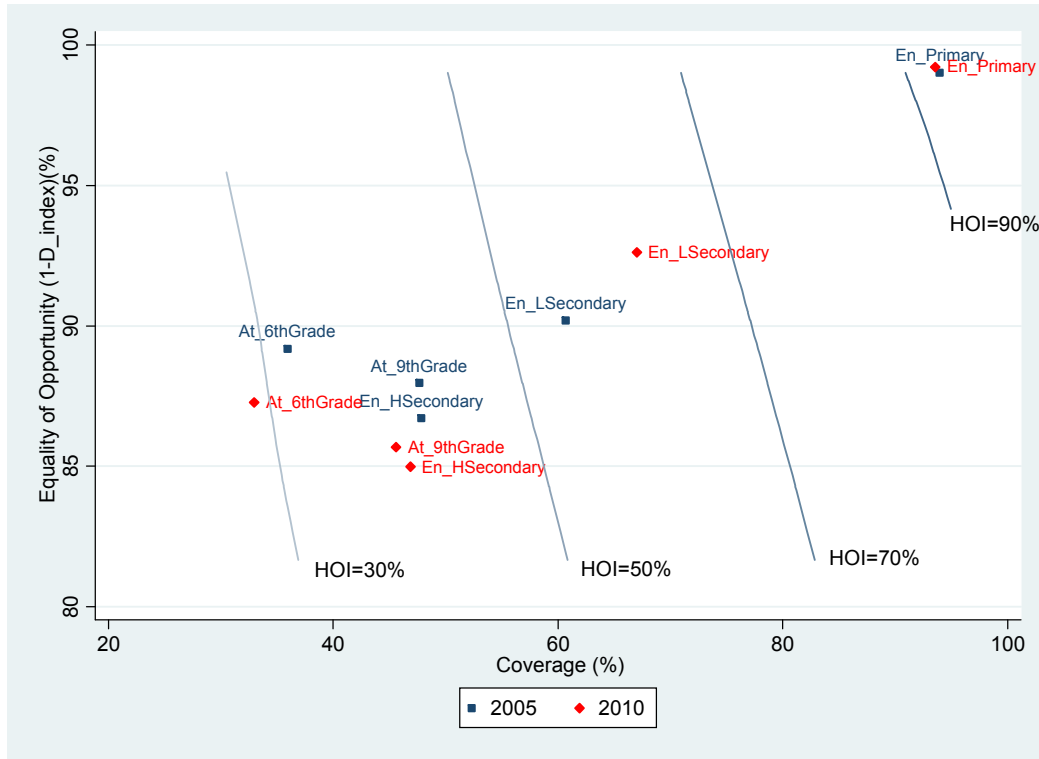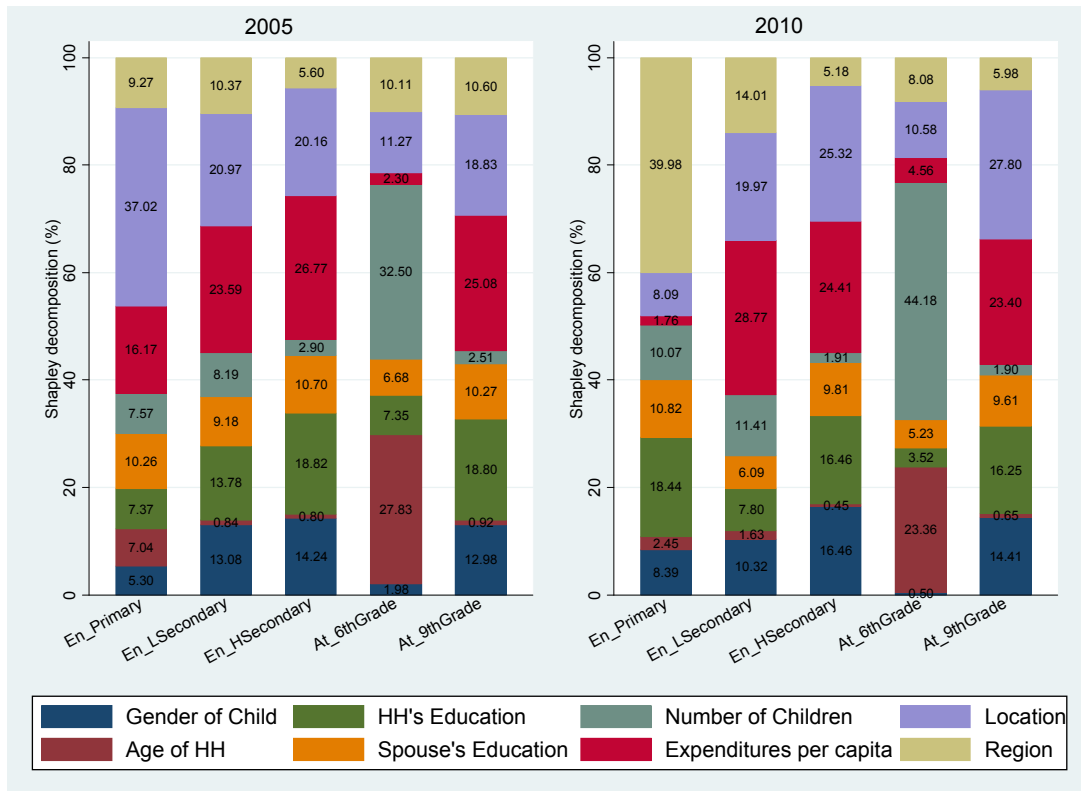

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Figure 8a: HOI Indexes for Enrollment in Different Schools Across Regions in 2005-2010

Source: Author's calculation from Tunisia Surveys 2005 and 2010

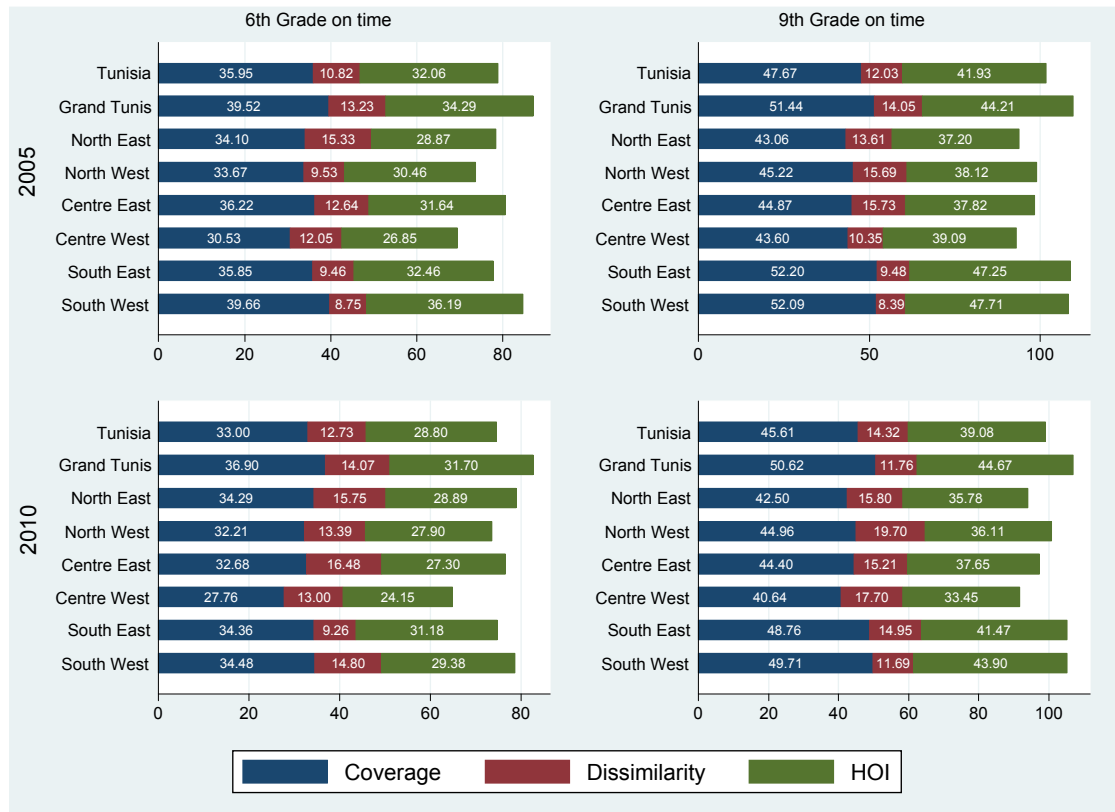**Figure 8b: HOI Indexes for Attainment In Different Levels Across Regions in 2005-2010**

Source: Author's calculation from Tunisia Surveys 2005 and 2010

Table 1a: Distribution of Districts and Households Sampled by Regions (2005 Survey)

Region	Total		Sample size		
	District	**Households**	**District**	**Households**	**Household sample percent (%)**
Grand Tunis	7 863	533 996	240	2 880	0.54
North East	4 446	316 199	156	1 872	0.59
North West	3 821	269 016	144	1 728	0.64
Central East	7 379	503 248	216	2 592	0.52
Central West	3 871	264 142	144	1 728	0.65
South East	2 711	186 278	108	1 296	0.7
South West	1 644	112 960	108	1 296	1.15
Total	31 735	2 185 839	1 116	13 392	0.61

Table 1b: Distribution of Districts and Households Sampled by Regions (2010 Survey)

Region	Total		Sample size		
	District	**Households**	**District**	**Households**	**Household sample percent (%)**
Grand Tunis	7 863	617 523	240	2 880	0.47
North East	4 446	348 691	156	1 872	0.54
North West	3 821	293 535	144	1 728	0.59
Central East	7 379	552 666	216	2 592	0.47
Central West	3 871	305 022	144	1 728	0.57
South East	2 711	202 006	108	1 296	0.64
South West	1 644	124 685	108	1 296	1.04
Total	31735	2 444 128	1116	13392	0.55

Source: The Economic Research Forum (ERF): http://www.erfdataportal.com; and the National Institute of Statistics-Tunisia (NSI). 2010.

Table 2a: Descriptive Statistics of Circumstance Variables (by Region) (2005)

Region	Residence Area	Gender of Child	Number of Children at home	Age of Household Head	Household Head's education	Spouse's education	Per Capita Expenditure (TD)
Grand Tunis	85.61	50.07	1.41(1.07) [0-7]	47.70(10.64) [24-89]	31.48	27.93	2136.47(2259.80) [233-44206]
North East	55.89	48.43	1.50(1.16) [0-6]	48.00(11.49) [24-91]	19.86	19.41	1434.58(1165.11) [159.42-13683.33]
North West	34.60	50.65	1.64(1.30) [0-7]	48.96(12.38) [23-94]	15.92	11.52	1296.88(953.41) [158-8771]
Centre East	71.68	50.25	1.67(1.17) [0-6]	46.69(10.95) [23-89]	44.95	43.14	1978.13(2041.35) [185-54417]
Centre West	33.44	50.58	2.03(1.42) [0-8]	47.96(12.30) [19-89]	44.29	43.33	1118.03(1184.11) [85.39-13455]
South East	64.27	48.15	1.75(1.31) [0-8]	49.36(12.15) [18-92]	25.33	20.34	1732.70(1727.44) [171-21255]
South West	63.44	48.31	1.75(1.30) [0-10]	48.77(11.88) [26-96]	21.71	13.45	1350.97(1068.29) [161-8535]
Tunisia	60.43	49.63	1.66(1.25) [0-10]	48.03(11.61) [18-96]	30.68	27.55	1634.05(1688.15) [85.40-54417]

Table 2b: Descriptive Statistics of Circumstance Variables (by Region) (2010)

Region	Residence Area	Gender of Child	Number of Children at home	Age of Household Head	Household Head's education	Spouse's education	Per Capita Expenditure (TD)
Grand Tunis	91.08	50.06	1.28(1.05) [0-5]	48.75(10.13) [25-90]	30.30	27.18	2853.53(2135.22) [445.99-29724.24]
North East	60.77	48.98	1.42(1.08) [0-5]	47.42(10.41) [23-90]	17.19	14.53	2065.19(1237.68) [370.07-10251.13]
North West	39.66	50.57	1.40(1.17) [0-6]	49.76(12.13) [21-92]	15.08	13.96	1674.44(1378.85) [147.57-18468.19]
Centre East	74.04	51.67	1.56(1.18) [0-6]	47.89(11.39) [25-99]	25.25	24.65	2882.11(2187.69) [222.69-25120.93]
Centre West	40.45	50.74	1.68(1.38) [0-7]	48.13(11.40) [21-91]	14.30	8.78	1583.48(1319.43) [190.92-23328.50]
South East	69.25	49.91	1.68(1.33) [0-8]	49.33(12.54) [25-94]	30.02	23.23	2278.09(1639.28) [244.83-18361.49]
South West	69.59	53.86	1.60(1.20) [0-6]	50.24(11.64) [22-91]	24.16	22.04	2067.32(1944.33) [280.80-22059.44]
Tunisia	63.99	50.83	1.51(1.21) [0-8]	48.66(11.37) [21-99]	22.26	19.43	2241.88(1828.86) [147.57-29724.24]

Note: The two Tables 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.

Appendix

Table A1: Summary of Human Opportunity Index on Selected Indicators for Tunisia (2005, 2010)

	Outcomes	2005					2010					Changes 2005-2010		
		Coverage (C)	Penality (P)	Dissimilarity (D)	Equality (E)	HOI	Coverage (C)	Penality (P)	Dissimilarity (D)	Equality (E)	HOI	Global Change	Scale effect	Distributional effet
Housing Services	Regular access to improved water	81.05	10.40	12.83	87.17	70.65	81.87	10.73	13.11	86.89	71.14	0.48	0.71	-0.23
	Access to sewage facilities	45.62	16.17	35.45	64.55	29.45	53.42	16.21	30.34	69.66	37.21	7.76	5.03	2.73
	Access to electricity	98.83	0.74	0.75	99.25	98.09	99.56	0.29	0.30	99.70	99.27	1.17	0.72	0.45
	Access to all basic services	44.95	16.19	36.03	63.97	28.76	50.80	16.80	33.07	66.93	34.00	5.24	3.74	1.50
Enrollment	Enrollment rate for age group 6-11 (primary level)	93.98	0.93	0.99	99.01	93.05	93.58	0.73	0.78	99.22	92.85	-0.20	-0.40	0.20
	Enrollment rate for age group 12-14 (Lower secondary level)	60.70	5.96	9.81	90.19	54.74	67.01	4.94	7.37	92.63	62.07	7.33	5.70	1.63
	Enrollment rate for age group 15-18 (Higher secondary level)	47.85	6.36	13.29	86.71	41.49	46.88	7.04	15.01	84.99	39.84	-1.65	-0.84	-0.81
Attainment	At_6thGrade	35.95	3.89	10.82	89.18	32.06	33.00	4.20	12.73	87.27	28.80	-3.26	-2.62	-0.63
	At_9thGrade	47.67	5.73	12.03	87.97	41.93	45.61	6.53	14.32	85.68	39.08	-2.86	-1.81	-1.05