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Abstract

Problems with inequality have been at the forefront of recent events in the Middle East and North Africa region. Yet by conventional measures such as wages and consumption, inequality is not particularly high. In this paper we explore an alternative dimension of inequality, specifically inequality of opportunity in higher education. We assess the determinants of attaining higher education in Egypt, Jordan, and Tunisia and quantify the extent and drivers of inequality of opportunity. We find that inequality is similarly high in Egypt and Tunisia, but moderate in Jordan. In all three countries family socio-economic characteristics are the primary driver of inequality. Family characteristics affect attainment even after accounting for test scores, which are themselves influenced by socio-economic status. Particularly in Egypt and Tunisia, where higher education is free of charge, public spending on higher education is ultimately regressive. Thus, a theoretically meritocratic and equitable system perpetuates inequality.

JEL Classifications: I23, I24, I28, D63

Keywords: Inequality; Higher education; Socio-economic mobility; Educational achievement; Education policy; Middle East and North Africa

ملخص

كانت مشكلات عدم المساواة في طليعة الأحداث الأخيرة في منطقة الشرق الأوسط وشمال أفريقيا. ولكن بعد التدابير التقليدية مثل الأجور والاستهلاك، نجد أن عدم المساواة ليست مرتفعة بشكل خاص. في هذه الورقة نستكشف بعدا بديلا من عدم المساواة، وتحديدا عدم تكافؤ الفرص في التعليم العالي. نقوم بتقييم المحددات لتحقيق التعليم العالي في مصر والأردن وتونس وقياس مدى عدم تكافؤ الفرص. نجد أن عدم المساواة مرتفعة بالمثل في مصر وتونس، ولكن معتدلة في الأردن. في الدول الثلاث نجد أن جميع الخصائص الاجتماعية والاقتصادية للأسرة هي الدافع الأساسي لعدم المساواة. خصائص الأسرة تؤثر على التحصيل حتى بعد احتساب درجات الاختبار، التي هي في حد ذاتها تتأثر بالوضع الاجتماعي والاقتصادي. وخاصة في مصر وتونس، حيث التعليم العالي مجانا، والإنفاق العام على التعليم العالي في تراجع في نهاية المطاف. وهكذا، فإن نظام الجدارة من الناحية النظرية والعادل يديم عدم المساواة.

1. Introduction

A perceived lack of social justice played a key role in the recent political events and revolutions in the Middle East and North Africa (MENA) region, referred to as the Arab Spring (World Bank, 2013). Standard economic measures, such as consumption, wages, and income in the region are not unusually unequal, nor has inequality increased substantially over time (Assaad, Krafft, Roemer, & Salehi-Isfahani, 2016a, 2016b; Bibi & Nabli, 2009; El Enbaby & Galal, 2015; Hassine, 2011, 2015; Verme, Milanovic, Al-Shawarby, et al., 2014; World Bank, 2015). One potential explanation for this apparent contradiction is that the region does not have high inequality in easily measurable economic outcomes, such as wages, but instead in areas of human development, such as education (Assaad & Krafft, 2016a). This paper investigates one aspect of inequality in human development that is under-researched in the region: access to higher education.

Substantial inequalities have been identified in levels of education prior to higher education in the MENA region (Assaad & Krafft, 2015a; Assaad, Salehi-Isfahani, & Hendy, 2014; El-Kogali & Krafft, 2015; Salehi-Isfahani, Hassine, & Assaad, 2014). Assessing inequality in higher education is more difficult, since young people often leave their families around the age of higher education, precluding an examination of the relationship between background and higher education using typical household survey data. The availability of new data in the region allows us, in this paper, to assess inequality of opportunity in higher education. Specifically, we examine the degree to which the background of young people determines their attainment of higher education. We focus our research on three countries: Egypt, Jordan, and Tunisia.

Our work specifically investigates the following question: how does family background affect access to higher education in the aforementioned countries? To answer this question, we analyze multiple dimensions of mobility into higher education and their links with the education policies of these countries. The recently released Egypt, Jordan, and Tunisia Labor Market Panel Surveys of 2012, 2010, and 2014 respectively (the ELMPS, JLMPS, and TLMPS), provide rich data on educational experiences and outcomes. Additionally, they include information on the family background of respondents, generating a unique opportunity for analyzing inequality of opportunity in higher education.

Factors we examine that might affect individuals' access to higher education include family socio-economic background, country of origin, region, place of residence (urban versus rural), and gender. The potentially mediating role of test scores in determining higher education access is also examined. We measure inequality of opportunity in higher education using a dissimilarity index. The dissimilarity index allows us to quantify what percentage of the opportunities to attain higher education would need to be redistributed for there to be equality of opportunity. We find high inequality of opportunity in Tunisia and Egypt, and moderate inequality of opportunity in Jordan. In all countries family socio-economic status, as captured by parents' education, is the primary driver of inequality of opportunity. Although test scores mediate some inequality of opportunity, individuals' background affects access to higher education even after accounting for test scores.

The paper proceeds as follows. In section two we provide background on each country's education system. The third section discusses our frameworks for understanding inequality and existing evidence on inequality. Section four describes our methods for assessing inequality. The data and sample are detailed in section five. The results on inequality are presented in section six. In the seventh, concluding section, we link the degree of inequality with the history and policies of countries' education systems and identify policy recommendations for education reform in the region.

2. Background

2.1 Education systems

Egypt, Jordan and Tunisia have similar, but by no means identical, education systems. Students typically enter school at age six to start primary (or basic) education (Figure 1). Although pre-primary education exists in all three countries it is not mandatory. It is typically utilized by well-off families, and is attended by between 20%-40% of children (El-Kogali & Krafft, 2015). In both Egypt and Tunisia, the primary stage lasts six years and is followed by a three-year preparatory (lower secondary or middle school) phase. In Jordan, the basic education stage lasts ten years and is followed by (upper) secondary education, either in the vocational track or general secondary (academic track). In Egypt general secondary essentially guarantees access to higher education, while in Jordan and Tunisia examinations at the end of general secondary determine access to higher education.

All three countries also have multiple types of higher education, including less selective two- or three-year programs as well as four-year programs. In Egypt two-year programs are called post-secondary institutes or above intermediate. In Jordan these are referred to as post-secondary institutes or intermediate, and in Tunisia short-cycle university (three year programs). In Egypt there are two types of four-year programs, those at higher institutes, which are less prestigious, and those in university. Jordan and Tunisia lack this distinction between university and higher institutes and their only four-year programs are university (long-cycle, in Tunisia).[1] Additionally, in all three countries, there are graduate programs of varying lengths.

2.2 Higher education systems

Legally, access to higher education is determined primarily by test scores. In Egypt, to enroll in public universities, students express preferences in terms of which institution and specialization they want to attend, assuming they meet the minimum test score requirements. Enrollments are allocated based on those preferences and test score. Similar rules for access to public higher education systems pertain in Jordan and Tunisia. Private higher education may be particularly appealing to individuals from wealthy families, who did not receive the scores required for public higher education, for a particular higher education institution, or a particular specialization. This is the case in Egypt, where a primary appeal of private higher education is easy access to a credential (Barsoum, 2016; Krafft, Elbadawy, & Sieverding, 2016).

3. Theoretical Framework

Education is commonly framed as a basic human right. Free, compulsory primary education is identified as a right of children in the Convention on the Rights of the Child (CRC), to which Egypt, Jordan, and Tunisia are signatories (United Nations Office of the High Commissioner for Human Rights, 1990). Equal opportunities for access to education are a particular emphasis of the CRC. The CRC further identifies making higher education accessible to all, while recognizing capacity constraints. In Egypt, the right to a free education is set forth in the constitution (Egypt State Information Service, 2014). Jordan guarantees the right to a free, publicly provided elementary education, and further that "The Government shall ensure work and education within the limits of its possibilities" ("The Constitution of the Hashemite Kingdom of Jordan," 1952). Tunisia's 2014 constitution, like that of Egypt, guarantees the right to free public education at all levels ("Tunisia's Constitution of 2014," 2014). Although there is a strong international norm of free, compulsory basic education, there is greater tension in terms of how widely higher education should be available. Particularly in MENA, the supply of educated labor is mismatched with demand for educated labor, contributing to high rates of unemployment among educated youth (Assaad & Krafft, 2016b; Narayan, Saavedra-Chanduvi,

[1] As of 2007, Tunisia moved to a new system of a three year diploma (licensure) and additional two year diploma (masters) on top of licensure. Given the timing of our survey and sample restrictions to ages 25+, the vast majority of the sample experienced the old system.

& Tiwari, 2013; World Bank, 2013). Rapid expansion of higher education has created social and economic challenges, particularly in Tunisia, where higher education enrollments grew rapidly (Assaad, Ghazouani, & Krafft, 2016a).

In a context where access to higher education is finite, the issue of whether young people face equal opportunities to attend higher education is of substantial social and economic importance. In the countries we study, access to higher education at all, as well as the type of higher education, is supposed to be determined by test scores in the preceding levels of school. The test scores that young people achieve in school, and therefore their access to higher education, is in turn determined by a combination of their efforts (in studying) and the familial and school resources that support that studying.

Drawing on the concept of equality of opportunity (Roemer, 1998), inequality in outcomes such as attending higher education can be partitioned into two parts. One part is due to *efforts* and the other due to *circumstances*. Inequality due to efforts includes things within the control of individuals, such as time spent studying. Inequality due to circumstances includes factors outside the control of individuals, such as where they were born, their gender, or their families' resources. Inequality due to effort is morally acceptable and socially desirable, as it incentivizes effort. Inequality due to circumstances beyond individuals' control is morally repugnant and termed *inequality of opportunity*. It is this type of inequality that we are concerned with in this paper.

Inequality of opportunity could manifest itself directly, for instance when youth are required to attend only universities in their region and certain regions have more or fewer universities. Inequality of opportunity could also occur indirectly, by affecting efforts. For instance, family circumstances, such as needing children to work to meet basic needs, could cut into studying time, and thus affect the amount of effort children can expend. Following other studies which distinguish the direct and indirect effect of circumstances (Bourguignon, Ferreira, & Menendez, 2007), this paper disentangles the indirect effects of circumstances, as mediated through test scores, and circumstances that affect higher education access directly.

In general, we model access to higher education, A, as a function, $g(.)$, of individual i's circumstances, C_i, and unobservables, η_i:

$$A_i = g(C_i, \eta_i) \quad (1)$$

We refer to this as the "reduced form" model because the effects of circumstances may be mediated through a variety of factors, such as test scores, and contrast this with a "structural" model that explicitly includes test scores. The structural approach assumes that test scores, T, are a function, $f(.)$, of circumstances, and unobserved determinants v_i:

$$T_i = f(C_i, v_i) \quad (2)$$

The structural model of the direct effects of circumstances on higher education access, A, the indirect effects through T on A, and remaining unobserved determinants of higher education access, υ_i, can then be modeled as:

$$A_i = g(C_i, T_i, \upsilon_i) \quad (3)$$

Which, by extension, is:

$$A_i = g(C_i, f(C_i, v_i), \upsilon_i) \quad (4)$$

The empirical models with test scores are, however, contingent on reaching the stage at which the exam is taken and thus offer an understanding of inequality for only a subset of young people. Comparing the effects of different circumstances, such as region, in the reduced form and structural models can be informative as to whether circumstances are affecting access directly, or in ways that are mediated through preceding educational experiences.

3.1 Existing evidence on inequality in education

While relatively little has been written about inequality of opportunity in access to higher education in the MENA region, there is some evidence on inequality of opportunity in preceding levels of education. This inequality of opportunity starts before children even enter primary, with substantial inequality of opportunity in attending early childhood care and education (ECCE) (El-Kogali & Krafft, 2015). The extent of inequality of opportunity, as measured by the dissimilarity index, implies that 21.8% of the opportunities to attend ECCE would have to be reallocated for equality of opportunity to prevail in Egypt, 24.4% in Jordan, and 25.5% in Tunisia.

While Egypt, Jordan, and Tunisia have essentially achieved universal primary enrollment (El-Kogali & Krafft, 2015; Elbadawy, 2015), this is a relatively recent achievement. Looking at a sample of youth under age 18 with household surveys during the 2000s from seven MENA countries, Assaad, Salehi-Isfahani and Hendy (2014) find that, while there are disparities by gender and background across all the studied countries, Tunisia has the lowest chance (0% for a boy and 5% for a girl) of a most vulnerable child not entering school. Jordan is next lowest, a 1% chance for a most vulnerable boy and an 11% chance for a most vulnerable girl. Egypt has the third lowest chances, a 17% chance of never attending for the most vulnerable boy and a 25% chance of never attending for the most vulnerable girl. These three countries have the lowest chances of vulnerable children never entering school among the seven studied, but also show substantial variation. Across countries, essentially all advantaged children enter secondary, while Egypt and Jordan, followed by Tunisia, do the best in providing secondary access to most vulnerable youth. By this stage there are already large disparities that will affect higher education access; for instance, only 41% of the most vulnerable boys and 30% of the most vulnerable girls enter secondary in Tunisia. Although the work of Assaad, Salehi-Isfahani and Hendy (2014) is the only comparative work to date, country specific studies confirm the overall pattern of relatively low inequality of opportunity in primary education, increasing at the secondary level (Ersado & Aran, 2014; Jemmali & Amara, 2015).

Inequality of opportunity is also visible in educational achievement, specifically in work on inequality of opportunity using the Trends in International Mathematics and Science Study (TIMSS) (Hashemi & Intini, 2015; Salehi-Isfahani, Hassine, & Assaad, 2014). One study using the TIMSS found that, while Jordan and Tunisia have comparable inequality of opportunity, Egypt has particularly high inequality of opportunity, higher than is typical even in the notably unequal region of Latin America (Salehi-Isfahani, Hassine, & Assaad, 2014).

Because higher education aged youth and especially higher education graduates do not all live with their families (and thus background is difficult to measure), there is little evidence on inequality of opportunity on higher education in MENA. Existing studies pertain to Egypt, where

there is substantial inequality in higher education access. The wealth of the family is a particularly important determinant of education. In Egypt, only 9% of youth from the poorest 20% of households make it to university compared to 80% of youth from the richest 20% of households (Assaad, 2013). Father's education and especially mothers' education also are important determinants of access as well. Not only does background affect access to higher education, it affects inequality of opportunity within higher education, for instance impacting the specializations young people can access (Krafft, Elbadawy, & Assaad, 2013).

The landscape of private versus public higher education may also affect access; in Egypt and Jordan, previous studies have demonstrated that attending private higher education is more common for men than women, more prevalent in certain regions, and shaped by socio-economic status (Assaad, Krafft, & Salehi-Isfahani, 2014; Buckner, 2013). Paying for private higher education may be a method for wealthier families to circumvent test score requirements

at public institutions that precluded access overall, or access to preferred specializations (Barsoum, 2016; Krafft, Elbadawy, & Sieverding, 2016).

4. Methods

We empirically implement our model of higher education access as a function of individual background circumstances and test scores, as discussed theoretically above, with a logit model for the probability of attaining higher education. To quantify inequality of opportunity in higher education, we rely on the dissimilarity index (D-index), commonly used for quantifying inequality in binary outcomes, such as attaining a certain level of education (de Barros, Ferreira, Vega, & Chanduvi, 2009; de Barros, Vega, & Saavedra, 2008). The D-index is based on comparing the mean p_i for unique circumstance group i to the population mean $\bar{p}$ with sample weights or population shares α_i as follows:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{k} \alpha_i |p_i - \bar{p}| \tag{5}$$

This D-index can be interpreted as the percentage of opportunities that would have to be redistributed from groups that are better off than the mean to groups that are worse off than the mean for equality of opportunity to have prevailed. The D-index will range from 0 to 1 or 0% to 100% when presented as a percentage, with zero indicating perfect equality of opportunity.

We implement the D-index empirically by using a logistic regression model,[2] where the predicted value of attaining higher education, $\hat{p}_j$, based on the individual circumstances of individual j, is used in the place of the group mean p_i. All individuals with the same circumstances will have the same predicted value, allowing us to estimate the D-index, $\widehat{D}$ (de Barros, Vega, & Saavedra, 2008).[3]

Based on the D-index, we can further assess the role of the different factors that are contributing to inequality of opportunity, such as the role of sex or mother's education, by using a Shapley decomposition (Deutsch & Silber, 2008; Shorrocks, 2013). The decomposition relies on calculating the marginal contributions of each circumstance or group of circumstances as they are removed in sequence. Denote the set of circumstances $x \in X = \{1,2,\dots,m\}$ and describe the order in which circumstances are removed as $\sigma = (\sigma_1, \sigma_2, \dots, \sigma_m)$, with $S(\sigma_r, \sigma) = \{\sigma_i |\, i > r\}$ being the set of circumstances remaining after circumstance σ_r has been eliminated. For a specific order of circumstance subtraction, the marginal contribution of circumstance x to the D-index is:

$$C_x^{\sigma} = D(S(x,\sigma) \cup \{x\}) - D\big(S(x,\sigma)\big) = \Delta_x D\big(S(x,\sigma)\big), \quad x \in X, \tag{6}$$

where

$$\Delta_x D\big(S(x,\sigma)\big) \equiv D(S \cup \{x\}) - D(S), \qquad S \subseteq X \backslash \{x\}, \tag{7}$$

is the change in the dissimilarity index that results from adding circumstance x to the set S. Because the contributions are path dependent, when variables are correlated the order of circumstance elimination matters. Thus, all possible elimination sequences are computed and the marginal impacts of circumstances are averaged over the possible sequences. If there are $m!$ potential sequences of elimination, denoted as the set Σ, the average contribution is (Shorrocks, 2013):

[2] We implement the D-index in STATA version 14.1 using the module hoi, version 1.7 (Azevedo, Franco, Rubiano, & Hoyos, 2010).

[3] See de Barros et al. (2008) for a discussion of the standard error.

$$C_x^S = \frac{1}{m!}\sum_{\sigma\in\Sigma} C_x^\sigma \quad (8)$$

This Shapley decomposition yields an additive decomposition of the D-index into the contributions of each circumstance (or group of circumstances, such as regions).

5. Data

In order to assess inequality of opportunity in higher education, data on not only educational attainment but also family background is required. Studying higher education is particularly challenging because, unlike for basic education, higher education aged youth are not necessarily ever observed living with their families. Thus, either panel or rich retrospective data are required to assess inequality of opportunity in higher education. In the MENA region, there are three surveys with rich data on family background: the Egypt Labor Market Panel Survey (ELMPS), the Jordan Labor Market Panel Survey (JLMPS) and the Tunisia Labor Market Panel Survey (TLMPS). We use the most recent round of the ELMPS, from 2012, and the only rounds (to date) of the JLMPS, 2010, and TLMPS, 2014.[4] All three surveys are nationally representative after the application of sampling weights. Initial sampling for the surveys occurred by drawing clusters as primary sampling units (PSUs) and then randomly selecting households within the cluster. Given this sampling design, we employ clustered standard errors in our regressions.

All three surveys capture detailed information on individuals' demographic, educational, and labor market experiences. Particularly important for the purposes of this paper is that data on parents' characteristics is captured, even when parents are not present in the household. Thus, we have information on mother's and father's education and employment. Further, data are collected about natal family composition, including siblings. Rich retrospective information capturing residential mobility is also included. Thus, we can assess a number of important dimensions of inequality of opportunity, although a number of important aspects of the early environment, such as health and nutrition, are not captured.

5.1 Sample and sample characteristics

We chose to analyze individuals aged 25-59 in order to examine the individuals' final educational attainment. Egypt had a sample of 19,665 individuals, Jordan 9,208 individuals, and Tunisia 6,747 individuals in this age range.[5] In Table 1, we show the background characteristics of the different samples. All samples contained an almost even split between male and female respondents. In Egypt a majority (55%) of the sample lived in a rural area as children. The Tunisian sample shows that most respondents lived in an urban area (65%) during childhood. In Egypt the sample showed a greater number of respondents originating from rural Upper Egypt (23%) and rural Lower Egypt (32%). It also showed a large share of respondents spent their childhood in Greater Cairo (18%). For Jordan a majority of respondents spent their childhood in central Jordan (63%). In Tunisia the plurality of respondents came from the North region (40%), with fewer from the center and south. For Jordan we also examine variation in nation of birth, as Jordan (unlike Egypt and Tunisia) has a substantial immigrant population. The majority of respondents in Jordan were born within the nation, but a sizable minority (22%) were born elsewhere.

Parental educational attainment varied across countries. A majority of the respondents from Egypt, Jordan, and Tunisia had illiterate mothers. Mother's education did not greatly increase beyond the ability to read and write in all three nations as well. Respondents in Egypt and Jordan saw very few mothers with higher education (3%) while Tunisia had even fewer (1%). Father's education across each nation had greater variation. In Egypt, the majority of fathers

[4] See Assaad & Krafft (2013) for additional information on the ELMPS 2012. See Assaad (2014) for more details on the JLMPS 2010. See Assaad et al. (2016) for further information about the TLMPS 2014.

[5] Tunisia, in particular, has an issue with missing data, although the data is largely missing at random; see Assaad et al. (2016).

were illiterate but more were able to reach basic education (12%) and even higher education (7%) than was the case for mothers. In Jordan a plurality of the sample had fathers who were able to read and write (46%). Jordanian respondents also had the greatest chance of a father that reached higher education (9%). Tunisian respondents had the most illiterate fathers (63%) and the fewest fathers who reached higher education (2%). A majority of fathers worked in the private sector in all three countries. The sample also had varying family sizes. In Egypt and Tunisia a majority of those sampled had 3-7 siblings while in Jordan a majority had eight or more. For all three countries the respondents were least likely to have 0-2 siblings.

6. Results

In this section we present our results showing inequality of opportunity in higher education attainment. We begin in the first sub-section with a discussion of education trends over time. We then present dissimilarity indices to show what percentage of opportunities would have to be redistributed from the better off to worse off for equality of opportunity to prevail. In order to assess the role of specific different background characteristics, we subsequently present bivariate relationships and the multivariate regression results, organized around different characteristics. Lastly, we estimate additional models incorporating test scores, a measure of merit or potentially effort.

6.1 Education trends over time

In Figure 2 we show education trends in terms of individuals' final attainment by year of birth and country. Egypt shows a steady increase in higher education and secondary education. Higher education rose from around 10% among those born in 1955 to almost 30% by the 1985 cohort. The greatest change Egypt experienced was from the 1955 cohort onward where the illiteracy rate dropped from nearly 50% to almost 10%. Jordan was able to dramatically increase basic education while almost eliminating illiteracy within the nation; by the 1985 birth cohort illiteracy was nearly 0% and basic education around 40%. All other levels of education grew slowly in Jordan. Tunisia's education system expanded later than Egypt or Jordan. Higher education was below 5% for cohorts born into the 1970s, but higher education expanded rapidly in recent decades.

6.2 Quantification of inequality and its drivers

To quantify the observed patterns of inequality and consider what would have to change for equality of opportunity to prevail, in this section we turn to the D-index. Further, we present the Shapley decomposition to show what, specifically, the drivers of inequality are. There are, to the authors' knowledge, no other studies of higher education inequality using the D-index, presumably due to data limitations. However, there are studies of lower levels of education from throughout the globe that can be used for comparison.[6] Early childhood care and education (ECCE) had a D-index of 21.8 in Egypt, 24.4 in Jordan, and 25.5 in Tunisia (El-Kogali & Krafft, 2015). ECCE was notably the early childhood indicator with the highest inequality in the twelve ECD measures in that study. In Morocco, one of the countries in the region struggling with enrollments, just 49.8% of youth finished primary school as of 2007 and the D-index was 17.7, the highest of the six countries in the MENA region in that study (Krishnan, Ibarra, Narayan, Tiwari, & Vishwanath, 2016). Looking at almost 50 developing countries throughout the globe, the highest D-index in primary completion was 43.5 in Niger, where only 10.4% of children complete primary (World Bank, 2016).

With these reference points in mind, we can see in Table 2 that Egypt has high inequality. To create equal opportunity 36.6% of opportunities to attain higher education would need to be redistributed to those who are worse off. The two primary drivers of inequality are mother's education (27.2% of inequality) and father's education (42.3% of inequality). There are also

[6] It should be noted that as enrollments approach universal, necessarily the D-index decreases.

smaller contributions stemming from father's work sector and region. Jordan has less inequality of opportunity. Jordan would need to redistribute 18.7% of opportunities for there to be equality of opportunity. The inequality in Jordan is derived primarily from mother's education (35.8%) and father's education (43.0%). Father's job sector as well as number of siblings also contribute to inequality in higher education attainment. Inequality is high in Tunisia, where 37.3% of opportunities to attain higher education would have to be redistributed from better off to worse off groups in order for equality of opportunity to prevail. This inequality is driven primarily by father's education (42.9%), followed by mother's education (22.1%) and urban/rural disparities (15.8%). There are small contributions from father's work sector, region, and number of siblings, and nearly zero from sex. Across countries, sex contributes less than 3% to all of the Shapley decompositions.

6.3 The role of different background characteristics

In this sub-section we examine the contributions of specific background characteristics to inequality to illustrate and understand the disparities that drive inequality of opportunity. In the multivariate models, we incorporate all of the individual characteristics we discussed in the data section, which were also included in the D-index and Shapley decomposition, as well as ten-year birth cohorts to model changes over time.[7] Marginal effects (changes in probability) for these same models are also presented in Table 3.[8]

Across all three nations higher education attainment does not differ greatly by sex. In Egypt male attainment (24%) is greater than female attainment (19%) by 5 percentage points. In Jordan and Tunisia female attainment (31% in Jordan, 14% in Tunisia) is one percentage point greater than male attainment. After controlling for other characteristics (Table 3), there are significant differences by sex in Egypt. Females had a 5.3 percentage point (p.p.) lower probability of attaining higher education than males. There were no significant differences in Jordan or Tunisia.

Egypt, Jordan, and Tunisia all follow the same pattern in regards to the relationship between attaining a higher education and mother's education (Figure 3). Those with illiterate mothers in all three nations are the least likely to attain higher education. Those with mothers who have received higher education are most likely to attain higher education as well. Jordan has the smallest disparity between those with highly educated mothers (79%) and illiterate mothers (23%) whereas Tunisia has the largest disparity between the two groups (91% versus 9%). In all three countries the level of mother's education affects higher education attainment even after accounting for other characteristics. In Egypt a student whose mother attained basic education has a greater chance of attaining higher education by 13.3 p.p. compared to an individual with an illiterate mother. In Jordan a mother with basic education does not significantly affect the likelihood her child will attain higher education. This may be a result of early expansion and access to basic education in Jordan (Assaad & Saleh, 2015). On the other hand, a Jordanian whose mother attained higher education has a 36.1 p.p. higher chance of attaining higher education compared to someone with an illiterate mother. In Tunisia, having a mother with higher education predicts a 35.9 p.p. greater chance of higher education than if one has an illiterate mother. Having an educated mother in all three countries increases the chance that one will attain higher education.

[7] Results splitting the data into a younger cohort (25-39 at the time of the survey) and an older cohort (40-59) suggest that there have been slight increases over time in the D-index in Jordan, where enrollment expanded only slightly across generations, but decreases in Egypt and Tunisia, where there were greater expansions in enrollment. However, the D-indices are not significantly different across generations.

[8] We tested incorporating interactions between sex and these characteristics, but there were few significant gender interactions; the primary pattern was a decreasing gender gap in attaining higher education over time.

Turning to disparities by father's education (Figure 4), it is notable that disparities are relatively smaller, possibly because mother's education more directly affects children's own attainment, as well as because having an educated mother is relatively rarer. In Egypt one can see that those with illiterate fathers are the least likely to have attained higher education (9%), while those who have fathers with secondary or higher education have much higher attainment (51% or 80%). In Jordan the size of the disparity is less, although the pattern of disparities persists. In Tunisia, those with illiterate fathers, 6% of whom attained higher education, have a huge gap from those with fathers who attained higher education, 70% of whom went on to themselves attain higher education. It is important to note that the disparity in Tunisia between those with secondary educated fathers (46% of whom attained higher education) and basic educated fathers (18% of whom attained higher education) is the largest amongst all three countries. After accounting for other characteristics, in all three nations father's education is almost always significant in determining higher education attainment. For example, having a father with higher education compared to an illiterate father increases your chances of attaining higher education by 45.7 p.p. in Egypt.

In all three nations where one's father worked is related to higher education attainment when examining the bivariate relationship. Those with fathers in the public sector have a higher likelihood of attaining higher education. Egypt has the greatest disparity between attainment for those with fathers in the private (15%) and public sector (35%) while Jordan has the least. Tunisia falls in the middle in terms of disparity, a 12% chance of higher education for individuals whose fathers worked in the private sector and a 24% chance for those whose fathers worked in the public sector. After controlling for other characteristics, in Egypt and Tunisia father's employment sector does not significantly affect higher education attainment but in Jordan it does. If one's father works in the public sector it increases the chances of attaining higher education by 5.4 p.p. compared to having a father in the private sector.

Especially in contexts where substantial financial outlays are required for young people to attain a higher education, families may have to be selective about which children, if any, to send to higher education, particularly in families with a large number of children. Fertility has fallen substantially over time in Egypt, Jordan, and Tunisia (Assaad, Ghazouani, & Krafft, 2016b; Department of Statistics (Jordan) & ICF International, 2013; Krafft & Assaad, 2014), so older generations are disproportionately over-represented in larger family sizes. Those families that were smaller may have made an intentional decision to invest in child "quality," including education, rather than child quantity (number of children). Certainly individuals from smaller families (with 0-2 siblings) have higher rates of higher education attendance than average in Egypt (42%), Jordan (55%) and Tunisia (27%) while those from larger families have lower chances of attending higher education. However, after controlling for other characteristics, number of siblings had varying significance. In Egypt and Jordan having 8+ siblings significantly reduces one's chances of attaining higher education compared to having 0-2 siblings. In Tunisia no category was significantly different from 0-2 siblings.

Access to higher education is likely to be affected by the local availability of education. In terms of urban versus rural disparities, in Egypt while 32% of individuals who spent their childhood in urban areas went on to higher education, just 13% of those who grew up in rural areas did so. In Tunisia, 17% of those who grew up in urban areas went on for higher education, compared to 6% of those in rural areas. Childhood urban or rural residence data is not available for Jordan, but there are some interesting differences in Jordan in terms of country of birth; while 29% of those born in Jordan attained higher education, a higher share, 36%, of those born out of the country did so. It is important to note that this is based on 2010 data and thus is likely to represent a somewhat different population of international migrants than in more recent years, when there have been large inflows of refugees, particularly from Syria. In Egypt, the regions incorporate urban/rural distinctions in the multivariate model and are discussed

below. In Tunisia individuals who grew up in rural areas have a significantly lower probability of attending higher education (-6.4 p.p.) than those who grew up in urban areas. The interior (rural) regions of Tunisia were the heart of the Jasmine revolution due in part to inequality (World Bank, 2014). There are not significant differences by country of birth for Jordanians.

Figure 5 shows higher education by childhood region of residence. There is relatively little inequality by region in Jordan; while those who grew up in the Middle region, which includes Amman, had a 32% chance of attending higher education, rates were slightly lower in the North and South of Jordan (28%). Disparities were much larger in Egypt and Tunisia. In Tunisia, rates were highest in the North (15%), Center East (17%) and South West (16%) and lower in the North West (7%), Center West (9%), and South East (11%). In Egypt, those raised in Greater Cairo had the highest chances of higher education (36%), followed by Alexandria and the Suez Canal region (31%), and urban Lower and Upper Egypt (28-29%). Rural areas, both rural Lower Egypt (16%) and rural Upper Egypt (10%) were where individuals had the lowest chance of higher education. Only in Egypt, after accounting for other characteristics, were there significant differences by region; living in a rural region and especially rural Upper Egypt predicts a significantly lower probability of higher education (-4.3 p.p. for rural Lower Egypt and -8.8 p.p. for rural Upper Egypt).

After accounting for other characteristics, trends by birth cohorts largely coincide with Figure 2, with a rising probability of higher education over time in Egypt and Tunisia. However, in Jordan, after accounting for other characteristics, there were insignificant but lower probabilities of higher education for the 1970s and 1980s birth cohorts compared to the 1950s birth cohort. This may reflect overall chances of enrollment stabilizing while backgrounds continued to improve.

6.4 Models incorporating test scores

Theoretically, access to higher education should be purely meritocratic, in that it relies on test scores. However, test scores are themselves likely to be determined by socio-economic background and individuals' characteristics, and background may affect access to higher education even after accounting for test scores. We explore both these possibilities in Table 4. Test scores were only collected in Egypt and Tunisia. First, we present regressions for test scores for those individuals who reached the stage of education that determines higher education tracking. This is preparatory in Egypt and secondary (the baccalaureate exam) in Tunisia. Additionally, we present the results for secondary scores for Egypt for comparability to Tunisia. Note that this necessarily excludes the effect of socio-economic status on reaching this stage of education. Second, we present logit model marginal effects for reaching higher education incorporating test scores as a control. The tests occur on different scales; the baccalaureate exam in Tunisia is out of 20, has a mean score of 10.4, a standard deviation of 2.3, and 43.8% of individuals missing a specific score. The preparatory exam in Egypt is out of 100, has a mean score of 72.3, with a standard deviation of 13.5 and 51.1% of individuals missing a specific score. The secondary exam in Egypt is out of 100, has a mean score of 73.1 with a standard deviation of 11.5 and 33.3% of individuals missing a specific score.

Looking at the results, a number of parental characteristics are significant predictors of test scores in Egypt, particularly parents' education. There are not as clear or significant patterns in Tunisia, although this may be driven by differences in sample size since the R-squared is only slightly lower in Tunisia, 13.4% compared to 19.5% in Egypt for preparatory and 11.4% for secondary. When including test scores in the logit model for higher education, in Egypt although the effects of background are somewhat reduced, they by no means disappear in either the preparatory or secondary model. Even after accounting for test scores, socio-economic status directly affects access to higher education. Additionally, after accounting for test scores (and knowing that girls tend to have higher test scores), females are significantly less likely to

attend higher education in Egypt. Likewise, the socio-economic differences in Tunisia persist even after accounting for test scores. Thus, in both countries, as well as inequality mediated through test scores, background directly affects the chances of higher education.

In Table 5 we analyze inequality in the sub-sample of people who reached the test score level in their country for Egypt and Tunisia, first without and then with test scores. This allows for three comparisons; first, by comparing Table 5 with Table 2 we can see how much of the D-index is driven by the contributions of circumstances before the test score stage versus at and after the test score stage. This can be discerned based on the change in the D-index in moving to the more restricted sample. Second, we can see how much inequality (the D-index) increases after accounting for test scores, allowing us to assess their relative role in inequality. Lastly, we can assess how much inequality is mediated through test scores by examining the Shapley decomposition.

First, it is notable that while Egypt and Tunisia have D-indices in Table 2 that are similar and around 37, when restricting to the test score sample the D-index is 23.6% for preparatory and 19.9% for secondary in Egypt and 10.7% for secondary in Tunisia. Thus, much more of inequality of opportunity in Tunisia is driven by what happens before, rather than at and after the test, specifically access to secondary. Second, the D-index only increases a little in Egypt, from 23.6% to 29.1% for preparatory, a 23.3% increase, with the addition of test scores. This modest increase suggests that such scores have relatively little additional explanatory power in terms of individuals' chances to attend higher education. A similar increase, from 19.9% to 24.9% is observed for secondary in Egypt. In Tunisia, the D-index increases from 10.7% to 22.5%, more than doubling. Test scores double the amount of inequality we can measure among those who reach secondary. The contributions of test scores in the Shapley decomposition are notable: 34.6% in Egypt for preparatory and 43.0% for secondary compared to 73.9% in Tunisia. Because the test score Shapley shares are larger than the relative increases in the D-index from adding test scores, this implies that test scores mediate some of the effects of socio-economic status as well, particularly in Tunisia, consistent with Table 4.

7. Discussion and Conclusions

Whether or not young people in MENA can attain a higher education shapes their entire life course, including transitions to work and family formation (Amer, 2014, 2015; Assaad & Krafft, 2014, 2015b). Access to higher education is not, however, universally or equally available in the region. Indeed, as this paper demonstrated, there is substantial inequality of opportunity in attaining a higher education in Egypt, Jordan, and Tunisia. By utilizing the D-index we discovered that Tunisia had the most inequality. A close second was Egypt, whereas Jordan had a considerably lower D-index. Although no other international comparisons of higher education inequality using the D-index are available, it is noteworthy that the inequality observed in all three countries is higher than inequality in primary completion for any of six countries in the region, and moreover that the inequality observed in Tunisia and Egypt is comparable to the country with the highest level of inequality for primary completion in a study of almost 50 countries throughout the globe (Krishnan, Ibarra, Narayan, Tiwari, & Vishwanath, 2016; World Bank, 2016).

The main drivers of inequality were the same across countries: parental education. In all three nations education is transmitted across generations. However, across countries gender inequality was notably small. When we incorporated test scores for Egypt and Tunisia, we found that much of the inequality in accessing higher education happened before higher education tracking in Tunisia, but less so in Egypt. The importance of test scores contributes to the prevalence of private tutoring, particularly among wealthier households (Assaad & Krafft, 2015a; Milovanovitch, 2014; Sieverding, Krafft, & Elbadawy, 2016). Test scores mediated some inequality of opportunity in both countries, but in Egypt there were larger

contributions from background even after accounting for test scores. The contrast between Egypt and Tunisia in terms of the role of test scores suggests an important avenue for further research in understanding what policy factors in the context of Tunisia might be implemented in Egypt to potentially reduce the direct influence of background.

A number of limitations of our research must be kept in mind. We did not have data for parents' income level, which would have been helpful and likely would have increased measured inequality. However, an Egyptian study demonstrated relatively small increases in measured inequality in economic outcomes when family income was added to parental education (Assaad, Krafft, Roemer, & Salehi-Isfahani, 2016b), so our focus on parental education is also likely to capture most inequalities. We also limited our study to those 25-59 years of age in order to assess final educational attainment. This restriction may magnify issues that no longer affect most people. For instance, gender disparities have decreased over time and countries now have "reverse" gender gaps. The age restriction may also minimize issues that strongly affect younger generations. Research in Egypt has demonstrated that measureable family socio-economic status plays a decreasing role in the economic mobility of youth. More difficult to measure aspects of social class may be increasingly driving inequality (Assaad, Krafft, Roemer, & Salehi-Isfahani, 2016b; Assaad & Krafft, 2014). Although education progress is theoretically meritocratic and based on test scores, connections or *wasta* play an important role in educational progress as well as labor market outcomes (Roushdy & Sieverding, 2015; Shirazi, 2015). .

Future research on how to reduce inequality of opportunity should pilot and evaluate programs centered on parental education and socio-economic status. We now know that parental education matters for higher education attainment. Governments can establish literacy programs so that adults who are illiterate can learn to read and write, and potentially help their children with schoolwork. Targeting illiterate women is particularly important, since it is primarily mothers who help with school work (Assaad & Krafft, 2015a).

An important finding of this research is that, despite policies centered on free public education, equality of opportunity in higher education does not prevail in MENA. The current funding landscape for higher education may affect access to education and contribute to inequality. In Tunisia, 7.4% of GDP goes to education spending and 2.0% of GDP is devoted to higher education spending (Abdessalem, 2010). Egypt is spending less on its education system, around 3.4% of GDP on public education overall (El-Baradei, 2013) and 1.1% of GDP on higher education (OECD/The World Bank, 2010). Jordan is making similar investments as well, with public spending on education around 4% of GDP and public spending on higher education amounting to 0.8% of GDP (Kanaan, Al-Salamat, & Hanania, 2010).

Notably, the two countries that guarantee free public higher education, Egypt and Tunisia, have the highest inequality of opportunity. Egypt and Tunisia spend a greater share of their education funding on higher education than Jordan (Abdessalem, 2010; El-Baradei, 2013; Kanaan, Al-Salamat, & Hanania, 2010). While we cannot easily establish causality, certainly the observed relationship is that free higher education in fact is related to greater inequality when comparing across countries. Therefore, we recommend that all three nations should allocate more of their education budget towards basic education to promote equality of opportunity. This is especially true of Egypt, where the constitution now mandates spending 4% of GDP on education and 2% on higher education (Egypt State Information Service, 2014), which is likely to further exacerbate inequality.

We recommend that Jordan in particular expand their basic education system to include free kindergarten for all children. Because Jordan is already prioritizing basic education they can afford to expand kindergarten. We also recommend that once Egypt and Tunisia improve basic education then they too can prioritize kindergarten. This may reduce school readiness

disparities between children with wealthy families and children that come from poorer families. Children that do enter basic education without first being in pre-primary education are at a disadvantage compared to children that were able to attend pre-primary programs (Krafft, 2015). It is mostly wealthy families that can afford pre-primary programs, such as kindergarten for their children (El-Kogali & Krafft, 2015). By reducing inequality early on countries may see a shift in inequality in higher education as well.

Egypt and Tunisia offer free higher education, per their constitutions (Egypt State Information Service, 2014; "Tunisia's Constitution of 2014," 2014). In contrast, in Jordan tuition provides around two-thirds of public universities' income compared to one-fifth of university income from government subsidies. Additionally, Jordan has a sizable private higher education sector (Kanaan, Al-Salamat, & Hanania, 2010). Free higher education is a regressive policy that primarily benefits the rich. Because the basic education systems within these nations, especially Egypt, are so poor, families invest substantially in tutoring (Assaad & Krafft, 2015a; Sieverding, Krafft, & Elbadawy, 2016). This contributes to primarily rich students progressing through the education system and benefiting from free tuition, as we demonstrated and others have discussed (Assaad, 2013). After taking into account the share of GDP devoted to higher education, the chances of attending, and the disparities observed in our study, we can illustrate the regressive nature of spending. For instance, Jordan on average spends 3.2% of per capita GDP annually on higher education for the offspring of an illiterate mother. Comparatively they provide 11.0% of per capita GDP for higher education to the offspring of a mother with higher education. In contrast, Egypt spends 4.7% of per capita GDP for the higher education of the offspring of an illiterate mother and 29.7% for the offspring of a highly educated mother. Tunisia has both the highest spending and the greatest disparity, spending 3.0% on the offspring of an illiterate mother and 30.3% on the offspring of a highly educated mother.[9] These disparities are further compounded by the fact that these are annual investments, and youth typically attend for four years. Additionally, there are disparate investments within higher education in different specializations that are further regressive (Assaad, Badawy, & Krafft, 2016; Krafft, Elbadawy, & Assaad, 2013). In all three countries public higher education funding is regressive, but this is especially so in Egypt and most of all in Tunisia.

Instead of offering free higher education Egypt and Tunisia should charge tuition and offer need-based scholarships. This will help ensure that poorer students receive the aid needed to complete their degree and that all members of society benefit from the higher education system, not only the wealthy. Determining the appropriate design for a national need-based policy, including communicating this option to young people, is an important area for future research. Because Tunisia suffers greatly from regional disparities we further recommend they target their scholarships to students in the interior region. In order to be effective, such scholarships should cover housing and transportation, as well as tuition. That way students may travel outside of their local to receive education if they wish.

Ultimately, the inequality in higher education is linked to inequalities throughout MENA societies. Inequality in early childhood development, basic, and secondary education contributes to inequality in higher education (Assaad & Krafft, 2015a; Assaad, Salehi-Isfahani, & Hendy, 2014; El-Kogali & Krafft, 2015; Salehi-Isfahani, Hassine, & Assaad, 2014). In turn, inequality in access to higher education affects labor market outcomes, particularly access to good jobs, and socio-economic mobility (Assaad & Krafft, 2014). Policies that make higher education attainment more equitable can help reduce a wide array of inequalities in MENA societies.

[9] Calculated based on percentage of GDP spent on higher education (Abdessalem, 2010; Kanaan, Al-Salamat, & Hanania, 2010; OECD/The World Bank, 2010), proportion of population currently in higher education at the time of the survey, and chances of attending higher education calculated in this paper.

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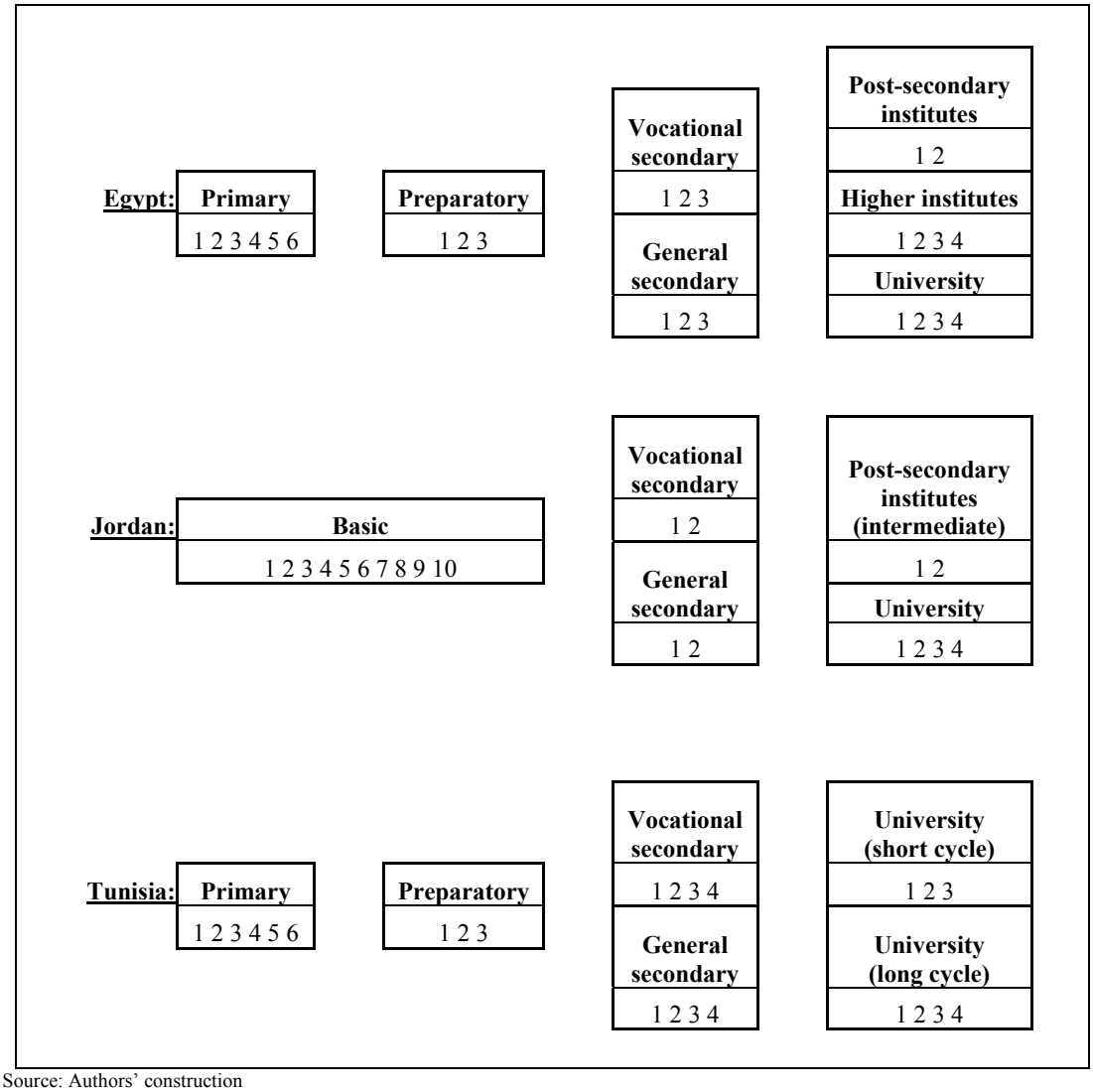
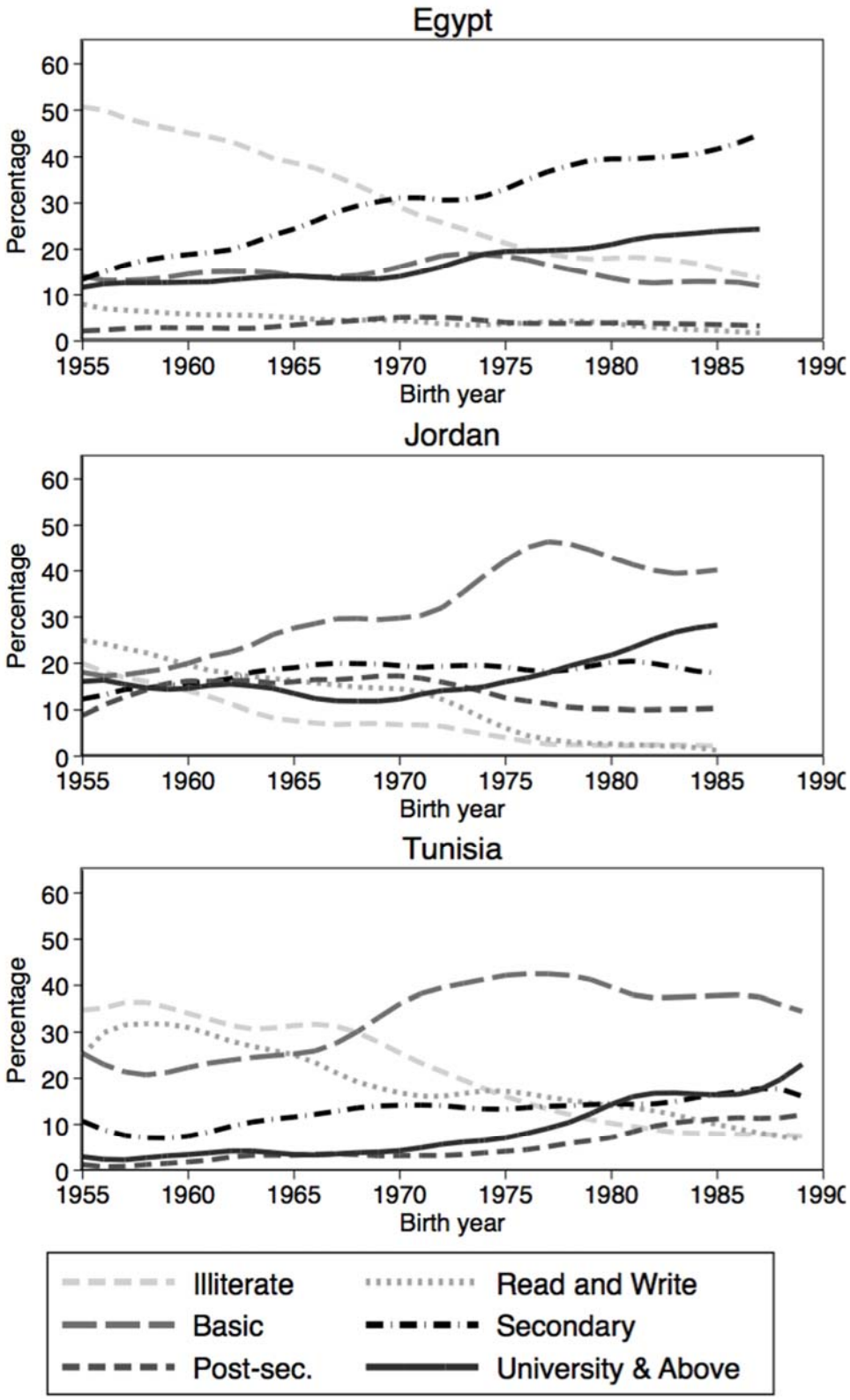
Figure 1: Structure of the Education Systems of Egypt, Jordan, and Tunisia



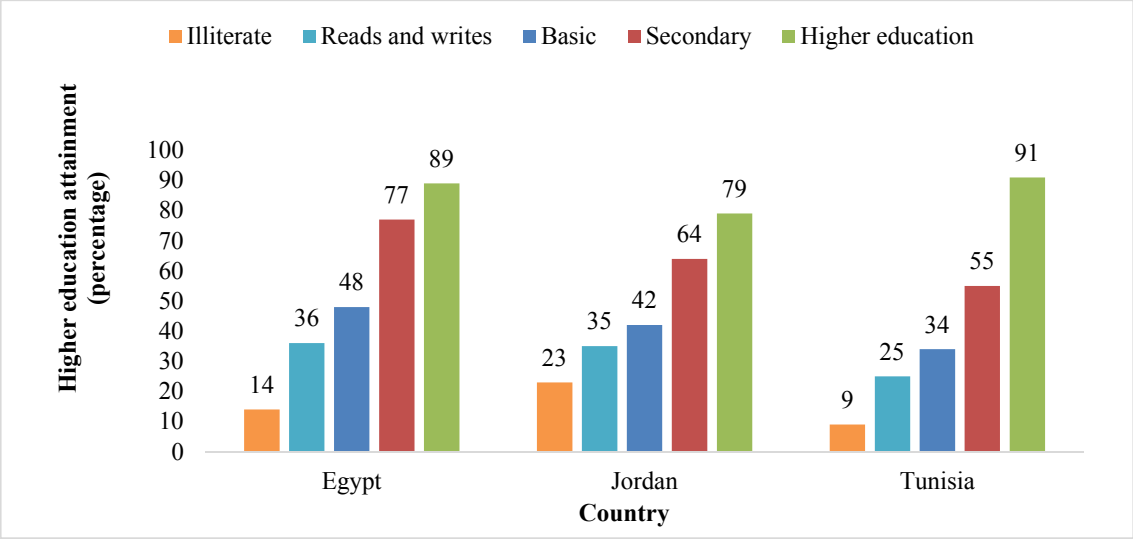
Source: Authors' construction

Figure 2; Educational Attainment by Year of Birth and Country for Birth Years 1955-1990



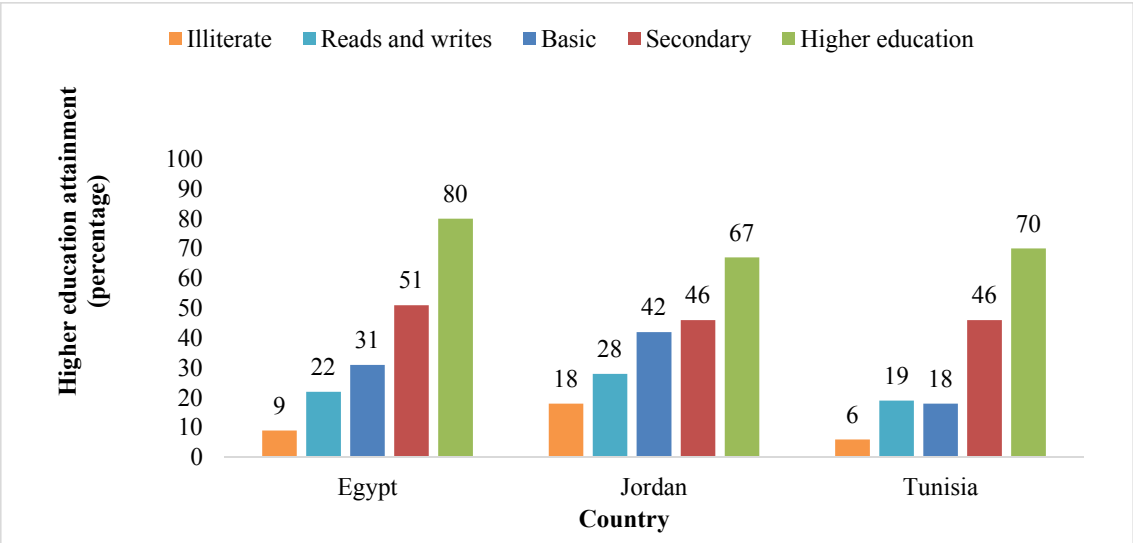
Notes: Restricted to sample ages 25-59 in the year of each survey
Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Figure 3: Higher Education Attainment (Percentage), by Mother's Education, Ages 25-59



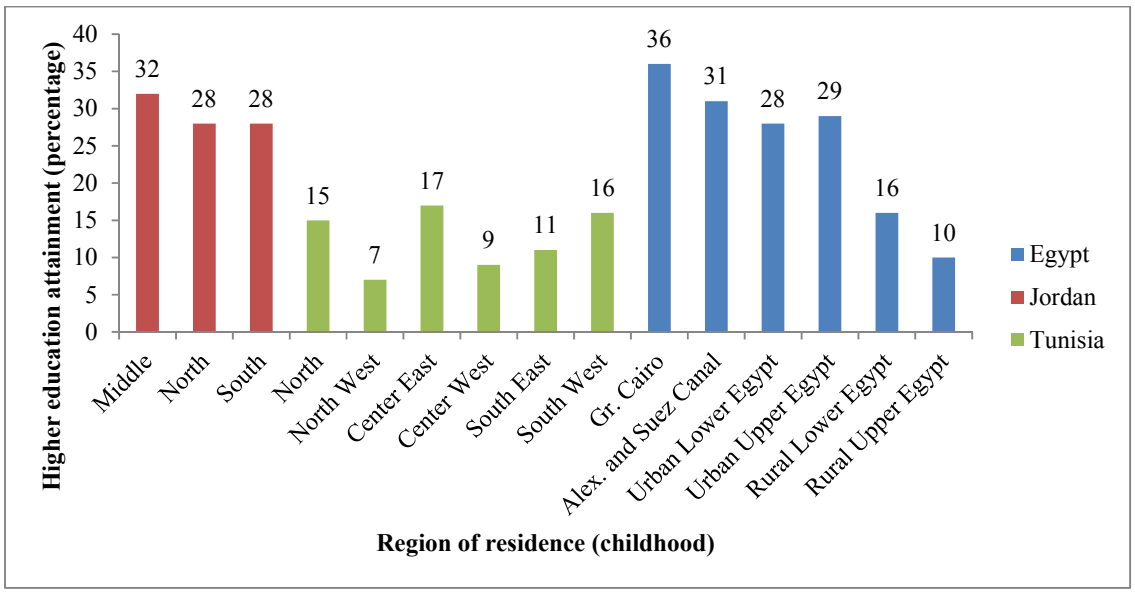
Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Figure 4: Higher Education Attainment (Percentage), by Father's Education, Ages 25-59



Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Figure 5: Higher Education Attainment (Percentage) by Region



Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Table 1: Characteristics of the Sample (Percentages)

	Egypt	Jordan	Tunisia
Sex			
Male	49	50	49
Female	51	50	51
Childhood urban or rural			
Urban	45		65
Rural	55		35
Region of childhood			
Middle		63	
North		27	
South		9	
North			40
North West			12
Center East			18
Center West			14
South East			11
South West			6
Gr. Cairo	18		
Alex. and Suez Canal	8		
Urban Lower Egypt	11		
Urban Upper Egypt	8		
Rural Lower Egypt	32		
Rural Upper Egypt	23		
Born out of country			
No		78	
Yes		22	
Mother's highest education			
Illiterate	80	63	84
Reads and writes	8	26	3
Basic	6	3	9
Secondary	4	5	3
Higher education	3	3	1
Father's highest education			
Illiterate	56	34	63
Reads and writes	19	46	5
Basic	12	2	23
Secondary	7	9	7
Higher education	7	9	2
Father's job sector			
Private	66	66	84
Public	34	34	16
No. siblings (categorical)			
0-2	12	2	14
3-7	67	39	67
8+	21	59	19
Total	100	100	100
N	19,665	9,208	6,747

Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Table 2: D-index and Shapley Decomposition (Percentages)

	Egypt	Jordan	Tunisia
D-index	36.577	18.671	37.296
Std. Error of D-index	(2.932)	(3.495)	(10.036)
Shapley decomposition			
Sex	2.6	0.4	0.4
Mother's Education	27.2	35.8	22.1
Father's Education	42.3	43.0	42.9
Father public sector	11.2	11.0	7.3
Siblings	4.9	8.0	4.9
Rural			15.8
Out of Country	1.0		
Region	11.9	0.7	6.8
Total	100.0	100.0	100.0
N (Observations)	19,499	9,131	5,402

Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Table 3: Logit Model Marginal Effects for Probability of Attending Higher Education By Country, Ages 25-59

Coefficients are marginal effects, standard errors in parentheses

	Egypt	Jordan	Tunisia
Sex (male omit.)			
Female	-0.053***	-0.005	0.005
	(0.007)	(0.010)	(0.011)
Mother's education (illit. omit.)			
Reads and writes	0.108***	0.053***	0.014
	(0.013)	(0.015)	(0.031)
Basic	0.133***	0.070	0.049*
	(0.018)	(0.040)	(0.022)
Secondary	0.259***	0.231***	0.066
	(0.027)	(0.036)	(0.037)
Higher education	0.325***	0.361***	0.359*
	(0.047)	(0.050)	(0.153)
Father's education (illit. omit.)			
Reads and writes	0.095***	0.082***	0.043
	(0.010)	(0.014)	(0.028)
Basic	0.141***	0.196***	0.059***
	(0.013)	(0.041)	(0.017)
Secondary	0.237***	0.193***	0.187***
	(0.022)	(0.027)	(0.041)
Higher education	0.457***	0.315***	0.273***
	(0.028)	(0.032)	(0.073)
Father's sector (private omit.)			
Public	0.006	0.054***	0.015
	(0.008)	(0.011)	(0.017)
Number of siblings (0-2 omit.)			
3-7	-0.018	-0.065	-0.032
	(0.011)	(0.039)	(0.021)
8+	-0.045***	-0.092*	-0.014
	(0.012)	(0.040)	(0.027)
Birth cohort (1950-1959 omit.)			
1960-1969	0.018	0.015	0.054***
	(0.010)	(0.021)	(0.014)
1970-1979	0.033**	-0.031	0.090***
	(0.010)	(0.020)	(0.015)
1980-1989	0.036***	-0.041	0.164***
	(0.010)	(0.024)	(0.018)
Childhood region (Gr. Cairo (Egypt) Central (Jordan) Tunis (Tunisia) omit.			
Egypt-Alx. Sz. Canal	-0.006		
	(0.017)		
Egypt-Urb. Lwr.	0.001		
	(0.017)		
Egypt-Urb. Upp.	0.017		
	(0.016)		
Egypt-Rur. Lwr.	-0.043**		
	(0.015)		
Egypt-Rur. Upp.	-0.088***		
	(0.016)		
Jordan-North		0.011	
		(0.014)	
Jordan-South		0.016	
		(0.022)	
Tunisia-North West			0.006
			(0.025)
Tunisia-Center East			0.022
			(0.019)
Tunisia-Center West			-0.006
			(0.023)
Tunisia-South East			0.004
			(0.019)
Tunisia-South West			0.040
			(0.035)
Born out of country		0.028	
		(0.016)	
Childhood residence (urban omit.)			
Rural			-0.064***
			(0.014)
N	19499	9113	4947

Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Table 4: Regression Models for Test Scores and Logit Model Marginal Effects for the Probability of Attending Higher Education by Country Incorporating Test Scores

	Regressions for test scores			Logit marginal effects for higher education		
	Egypt: Prep.	**Egypt: Sec.**	**Tunisia**	**Egypt: Prep.**	**Egypt: Sec.**	**Tunisia**
Sex (male omit.)						
Female	0.053	1.495**	0.036	-0.028*	-0.040**	0.037
	(0.639)	(0.489)	(0.243)	(0.012)	(0.015)	(0.037)
Mother's education (illit. omit.)						
Reads and writes	3.032**	0.718	0.105	0.106***	0.094***	0.049
	(1.157)	(0.692)	(0.465)	(0.022)	(0.025)	(0.092)
Basic	2.589	1.757	0.456	0.137***	0.119***	0.004
	(1.343)	(1.009)	(0.353)	(0.033)	(0.035)	(0.051)
Secondary	7.680***	4.131***	0.396	0.222***	0.232***	0.186*
	(1.310)	(0.959)	(0.547)	(0.041)	(0.042)	(0.080)
Higher education	9.584***	4.786**	0.435	0.266***	0.295***	0.334***
	(1.581)	(1.607)	(0.764)	(0.061)	(0.060)	(0.079)
Father's education (illit. omit.)						
Reads and writes	0.534	0.330	0.255	0.074***	0.057**	0.050
	(0.869)	(0.563)	(0.497)	(0.020)	(0.022)	(0.062)
Basic	1.152	1.483	0.181	0.109***	0.092***	0.087
	(1.084)	(0.793)	(0.335)	(0.022)	(0.023)	(0.047)
Secondary	5.358***	2.531*	0.633	0.179***	0.175***	0.093
	(1.334)	(1.043)	(0.477)	(0.033)	(0.032)	(0.072)
Higher education	8.031***	5.734***	1.588*	0.348***	0.323***	0.058
	(1.311)	(0.999)	(0.620)	(0.038)	(0.038)	(0.083)
Father's sector (private omit.)						
Public	-0.296	-0.170	-0.129	-0.022	-0.030	0.000
	(0.709)	(0.515)	(0.341)	(0.016)	(0.018)	(0.051)
Number of siblings (0-2 omit.)						
3-7	-0.829	-0.218	-0.436	-0.028	-0.030	0.033
	(0.693)	(0.718)	(0.324)	(0.020)	(0.021)	(0.049)
8+	-1.845	-0.142	-0.173	-0.043	-0.047	0.126*
	(1.084)	(0.921)	(0.531)	(0.026)	(0.027)	(0.060)
Birth cohort (1950-1959 omit.)						
1960-1969			-0.984			0.234
			(1.317)			(0.120)
1970-1979	-1.666	0.933	-1.436	0.004	-0.007	0.452***
	(1.105)	(0.917)	(1.250)	(0.021)	(0.023)	(0.085)
1980-1989	-1.139	2.367*	-0.687	0.066**	0.018	0.550***
	(1.227)	(0.926)	(1.243)	(0.022)	(0.025)	(0.081)
Childhood region (Gr. Cairo (Egypt) Tunis (Tunisia) omit.						
Egypt-Alx & Sz. Canal	-1.571	3.056***		-0.003	-0.023	
	(0.979)	(0.891)		(0.030)	(0.034)	
Egypt-Urb. Lwr.	2.986**	3.928***		0.032	0.010	
	(1.092)	(0.825)		(0.032)	(0.035)	
Egypt-Urb. Upp.	-0.991	1.097		0.056*	0.045	
	(1.154)	(1.080)		(0.028)	(0.031)	
Egypt-Rur. Lwr.	-0.304	1.835*		-0.012	-0.030	
	(1.036)	(0.725)		(0.027)	(0.031)	
Egypt-Rur. Upp.	-1.995	1.393		-0.034	-0.055	
	(1.224)	(0.865)		(0.030)	(0.034)	
Tunisia-North West			0.022			0.037
			(0.390)			(0.068)
Tunisia-Center East			-0.139			0.040
			(0.372)			(0.047)
Tunisia-Center West			-0.386			0.082
			(0.495)			(0.057)
Tunisia-South East			0.862*			-0.016
			(0.367)			(0.053)
Tunisia-South West			0.345			0.050
			(0.513)			(0.089)
Childhood residence (urban omit.)						
Rural			-0.336			-0.001
			(0.261)			(0.039)
Test score				0.017***	0.012***	0.156***
				(0.001)	(0.001)	(0.015)
Test score missing				-0.059***	-0.207***	-0.148***
				(0.015)	(0.017)	(0.033)
Constant	70.576***	66.954***	11.245***			
	(1.380)	(1.212)	(1.316)			
N	2717	3452	485	6048	5364	744
R-squared	0.195	0.114	0.134			

Notes:*p<<0.05; **p<0.01; ***p<0.001
Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

Table 5: Incorporating Test Scores in D-index and Shapley Decomposition (Percentages)

	Test score sample			Adding test scores		
	Egypt: Prep.	**Egypt: Sec.**	**Tunisia**	**Egypt: Prep.**	**Egypt: Sec.**	**Tunisia**
D-index	23.563	19.887	10.739	29.060	24.891	22.485
Std. Error of D-index	(3.713)	(3.452)	(6.715)	(3.404)	(3.023)	(7.079)
Shapley decomposition						
Sex	0.5	0.6	11.8	0.2	0.3	3.1
Mother's Education	37.4	37.6	35.5	25.0	22.0	9.6
Father's Education	41.0	40.8	29.2	27.7	24.0	7.3
Father public sector	7.4	7.2	5.6	4.4	3.5	1.4
Siblings	6.0	5.6	2.5	3.6	2.9	0.6
Rural			0.9			0.3
Region	7.7	8.1	14.6	4.4	4.2	3.6
Test score				34.6	43.0	73.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
N (Observations)	6,048	5,364	778	6,048	5,364	778

Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014