

Inequality of Opportunity in Higher Education in the Middle East and North Africa¹

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Abstract

Struggles with inequality have been prominent in the Middle East and North Africa in the aftermath of the Arab Spring. This paper examines the extent and drivers of inequality of opportunity in attaining higher education in Egypt, Jordan, and Tunisia. We find that inequality is similarly high in Egypt and Tunisia, but moderate in Jordan. Background characteristics affect attainment even after accounting for test scores, which are themselves influenced by background. Particularly in Egypt and Tunisia, where higher education is free of charge, public spending on higher education is regressive. Thus, a theoretically meritocratic and equitable system perpetuates inequality.

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

1 Introduction

A perceived lack of social justice played a key role in the recent events in the Middle East and North Africa (MENA) region, referred to as the Arab Spring (World Bank, 2013). However, standard economic measures, such as income, are not unusually unequal in the region, nor has inequality increased substantially over time (Assaad et al., 2016b; Belhaj Hassine, 2015, 2011). One explanation for this apparent contradiction is that the region does not have high inequality in easily measurable economic outcomes, such as income, but instead in human development, such as education (Assaad and Krafft, 2016). This paper investigates one aspect of inequality in human development that is under-researched in the region and throughout the globe: access to higher education.

Substantial inequalities have been identified in learning and attainment for pre-university levels in the MENA region (Assaad and Krafft, 2015; Assaad et al., 2014; Bouhlila, 2017; El-Kogali and Krafft, 2015; Salehi-Isfahani et al., 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 allows us, in this paper, to assess inequality of opportunity in higher education in Egypt, Jordan, and Tunisia.

The comparative element of this work has important implications for how policies, especially free higher education, may enable or inhibit access to higher education. While Egypt and Tunisia offer free higher education, Jordan does not. Globally, free higher education has been demanded in protests and proposed in political platforms as one method to combat inequality (e.g. Arango et al., 2016; Mateo, 2016; McKinley, 2017; South African Government News Agency, 2017). However, calls for free higher education as a solution to inequality lack solid empirical support. Evidence from developed countries suggests free higher education may

increase enrollments but is unlikely to be the most effective approach to reducing inequality. Depending on policy design, free education may even increase disparities (Dynarski, 2000; Heller and Marin, 2004). This work contributes comparative evidence from developing countries on the relationship between free higher education and inequality. The potentially mediating role of test scores in determining higher education access is also examined.

2 Background

2.1 Education systems

Egypt, Jordan and Tunisia have similar education systems. Pre-primary education is attended by between 20%-40% of children, primarily from well-off families, (El-Kogali and Krafft, 2015). Students typically enter school at age six to start primary (or basic) education. In Egypt and Tunisia, the primary stage lasts six years, followed by a three-year preparatory (lower secondary or middle school) phase. In Jordan, the basic education stage lasts ten years, followed by (upper) secondary education, either in the vocational 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 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.

2.2 Access to education

Education is commonly framed as a basic human right. Free, compulsory primary education is included 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 focus of the CRC. The

CRC further emphasizes making higher education accessible to all, while recognizing capacity constraints. In Egypt, the right to a free education is included in the constitution (Egypt State Information Service, 2014). Jordan guarantees the right to free basic education (Independent Election Commission of Jordan, 2016). Tunisia's 2014 constitution also guarantees the right to free education at all levels (Constitute Project, 2014).

In the countries we study, access to 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, are in turn determined by a combination of their efforts (in studying) and the familial and school resources that support that studying. 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, 2017; Krafft et al., 2017).

3 Inequality

3.1 Theoretical framework

Drawing on the concept of equality of opportunity (Roemer, 1998), inequality in outcomes such as attending higher education can be partitioned into two parts: efforts and 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 their sex or their families' resources. Inequality due to effort is morally acceptable and socially desirable, as it incentivizes effort. Inequality due to circumstances is

morally repugnant and termed *inequality of opportunity*. It is this type of inequality that we are concerned with in this paper.⁴

Inequality of opportunity could manifest itself directly, for instance when youth are required to attend only universities in their region. Inequality of opportunity could also occur indirectly, by affecting efforts. For instance, the family needing children to work could cut into studying time, and thus affect effort. This paper disentangles the indirect effects of circumstances, as mediated through test scores, and circumstances that affect higher education access directly (Bourguignon et al., 2007). Comparing the effects of different circumstances in the models without and with test scores can be informative as to whether circumstances are affecting access directly, or indirectly through preceding educational experiences.

3.2 Existing evidence on inequality in education

Inequality of opportunity starts before children enter primary, with substantial inequality of opportunity in early childhood care and education (ECCE) enrollment in MENA (El-Kogali and Krafft, 2015). While Egypt, Jordan, and Tunisia have essentially achieved universal primary enrollment, this is a relatively recent development. Examining seven MENA countries with data from the 2000s, Assaad, Salehi-Isfahani and Hendy (2014) find that, while there are disparities

⁴ There are a number of important caveats to implementing this framework. First, inequality of opportunity can only be assessed insofar as circumstances are measured. Second, particularly for education during childhood, some argue that inequalities in children's outcomes should be attributed entirely to circumstances (Hufe et al., 2015; Kanbur and Wagstaff, 2014). Since higher education is conditional on preceding educational performance, this argument might also be extended to higher education.

by sex and background across all the studied countries, Tunisia, Egypt, and Jordan have the lowest chances of vulnerable children never entering school. Essentially all advantaged children enter secondary, while Egypt and Jordan, followed by Tunisia, do the best in providing secondary access to vulnerable youth. By this stage there are already large disparities that will affect higher education access. For instance, among the most vulnerable only 41% of boys and 30% of girls enter secondary in Tunisia. Inequality of opportunity is also visible in educational achievement, measured by international assessments during primary and secondary (Bouhlila, 2017; Hashemi and Intini, 2015; Salehi-Isfahani et al., 2014). Disparities in achievement and attainment may be linked to varying degrees across countries.

Since higher education aged youth do not all live with their families (and thus background is difficult to measure), there is little evidence on inequality of opportunity in higher education in MENA. Existing studies pertain to Egypt, where there is substantial inequality in higher education access (Assaad, 2013; Cupito and Langsten, 2011). For example, only 9% of youth from the poorest quintile of households attend university compared to 80% of youth from the richest quintile of households (Assaad, 2013). Father's education and especially mother's education also are important determinants of access. The availability of private higher education may also affect access. In Egypt and Jordan, attending private higher education is more common for men than women, more prevalent in certain regions, and shaped by socio-economic status (Assaad et al., 2017b; Buckner, 2013).

4 Methods

We empirically model the probability of attaining higher education as a function of individual circumstances and test scores with a logistic model. To quantify inequality of opportunity in higher education, we rely on the dissimilarity index (D-index) (de Barros et al.,

2009, 2008). While numerous measures of inequality exist, the most common measures, such as the Theil or general entropy measures, are meant for a continuous outcome. The D-index is commonly used for quantifying inequality in binary outcomes, such as attaining a certain level of education. 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:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^k \alpha_i |p_i - \bar{p}| \quad (1)$$

The D-index can be interpreted as the percentage of opportunities that would have to be redistributed from groups that are better off to groups that are worse off for equality of opportunity to have prevailed.⁵ The D-index ranges from 0 to 1 (0% to 100%), with zero indicating perfect equality of opportunity.⁶ We implement the D-index parametrically by using a logistic regression model.⁷ One advantage of the D-index is that we can assess the role of the

⁵ As an example, consider the outcome of school enrollment. Pretend there are 200 children from two equal groups: 100 poor children and 100 rich children. Only 10 of the poor children (10% group mean) attend school while 20 of the rich children (20% group mean) are in school. There are 30 children in total in school (15% population mean). Calculating the D-index for this case shows that 16.7% of total opportunities to go to school (5 of the 30 spots) need to be reallocated from the rich to the poor for equality of opportunity to prevail. This yields 15 spots for each group and identical group means of 15%, equality of opportunity.

⁶ Since the D-index measures inequality relative to existing opportunities, it is invariant to increases in the outcome that are proportional across groups (de Barros et al., 2008).

⁷ We implement the D-index in STATA version 14.1 using the module hoi, version 1.7 (Azevedo et al., 2010). See de Barros et al. (2008) for a discussion of the standard error.

different circumstances in inequality of opportunity by using a Shapley decomposition (Deutsch and Silber, 2008; Shorrocks, 2013). This method yields an additive decomposition of the D-index into the contributions of each circumstance (or group of circumstances, such as regions).

5 Data

5.1 Surveys

Our data are the only three nationally representative surveys in the MENA region with sufficient data on family background: the Egypt Labor Market Panel Survey (ELMPS) 2012, the Jordan Labor Market Panel Survey (JLMPS) 2010 and the Tunisia Labor Market Panel Survey (TLMPS) 2014.⁸ Initial sampling for the surveys occurred by drawing clusters as primary sampling units. Given this sampling design, we employ clustered standard errors in our regressions.

All three surveys capture detailed information on individuals' demographics and educational experiences. The data include self-reported test scores for each level of education.⁹ Data on parents' characteristics (including education and employment) are captured, even when parents are not present in the household. Further, data are collected about number of siblings. We use retrospective information capturing residential mobility to determine childhood place of residence at the age of higher education testing in each country. Thus, we can assess a number of

⁸ See Assaad & Krafft (2013) on the ELMPS 2012. See Assaad (2014) on the JLMPS 2010. See Assaad et al. (2016a) on the TLMPS 2014. All data are publicly available (OAMDI, 2016, 2014, 2013).

⁹ Recall or measurement error in test scores is a concern since the data are self-reported.

important dimensions of inequality of opportunity, although a number of important aspects of the early environment, such as nutrition, are not captured.

5.2 *Sample and Sample Characteristics*

We analyze individuals aged 25-59 in order to examine individuals' final educational attainment.¹⁰ Egypt had a sample of 19,665 individuals, Jordan 9,208 individuals, and Tunisia 6,747 individuals in this age range.¹¹ In Table 1, we show the background characteristics of the different samples. All samples contained an almost even split between male and female respondents.

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			
Egypt-Gr. Cairo	18		
Egypt-Alx, Sz C.	8		
Egypt-Urb. Lwr.	11		
Egypt-Urb. Upp.	8		
Egypt-Rur. Lwr.	32		

¹⁰ Final educational attainment is the highest degree completed. Higher education is considered to be any two-year or longer degree completed. Ages 25-59 are selected to avoid those in their early 20s who are still in school.

¹¹ Tunisia, in particular, has an issue with missing data, although the data is largely missing at random; see Assaad et al. (2016a).

	Egypt	Jordan	Tunisia
Egypt-Rur. Upp.	23		
Jordan-Middle		63	
Jordan-North		27	
Jordan-South		9	
Tunisia-North			40
Tunisia-North West			12
Tunisia-Center East			18
Tunisia-Center West			14
Tunisia-South East			11
Tunisia-South West			6
Born abroad			
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

Parental educational attainment varied across countries. A majority of the respondents from Egypt, Jordan, and Tunisia had illiterate mothers and mother's education did not greatly increase beyond the ability to read and write. In Egypt, the majority of fathers were illiterate but

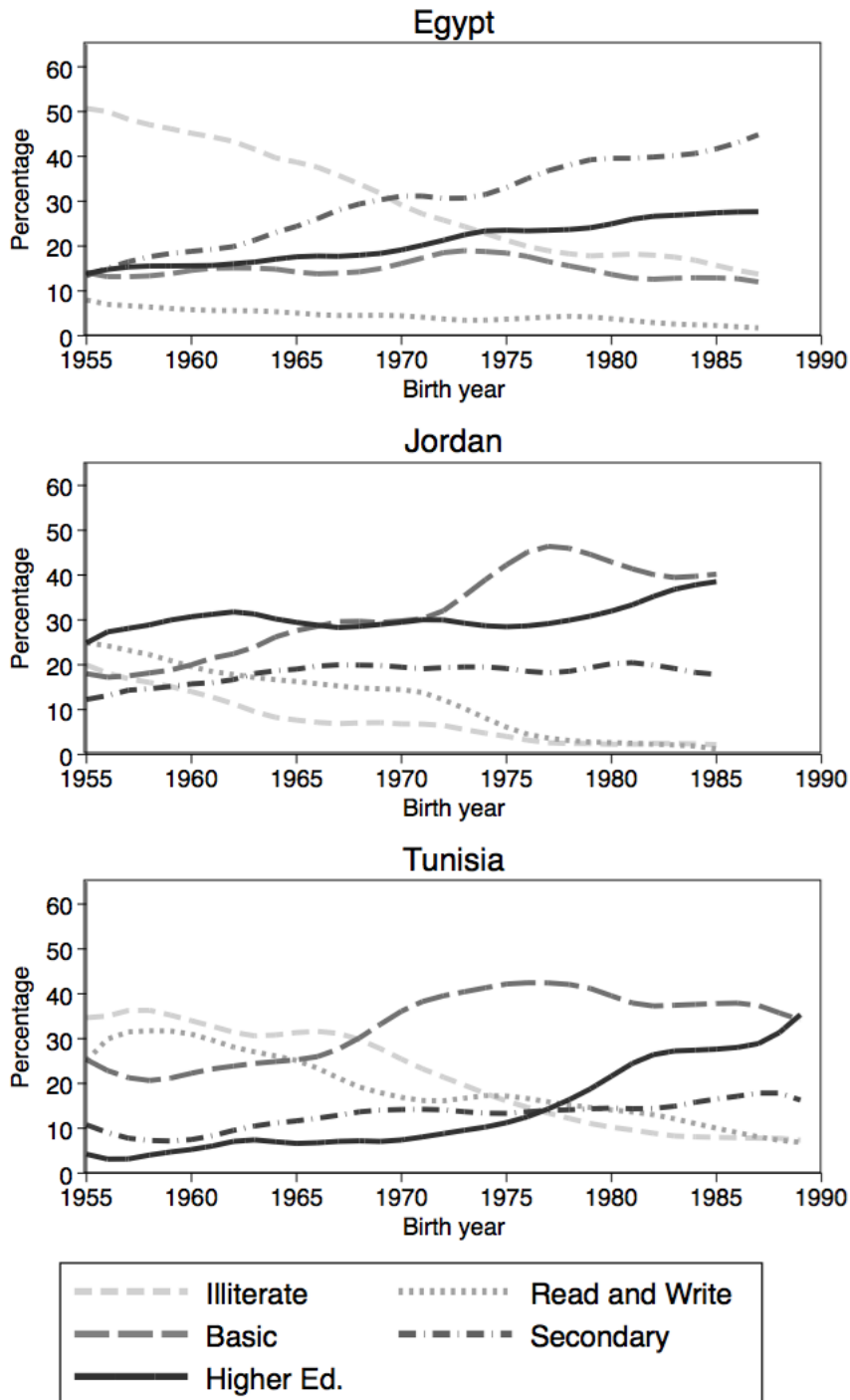
more were able to reach basic education (12%) and even higher education (7%) than was the case for mothers. In Jordan, while most fathers were only able to read and write (46%), there was the greatest chance that a father reached higher education (9%). Tunisian respondents had the most illiterate fathers (63%) and the fewest fathers who reached higher education (2%).

6 Results

6.1 Education trends over time

Figure 1 shows educational attainment trends by year of birth and country. In Egypt, higher education rose from just above 10% among those born in 1955 to almost 30% by the 1985 cohort. In Jordan, higher education rose from around 25% for the 1955 cohort to almost 40% by the 1985 cohort. Tunisia's education system expanded later than Egypt or Jordan. Higher education was below 10% for cohorts born into the 1970s, but higher education expanded rapidly in recent decades, approaching 30% by the 1985 cohort.

Figure 1. Educational attainment (percentage) by year of birth and country, birth years 1955-1989



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

6.2 *Quantification of inequality and its drivers*

To quantify inequality, in this section we turn to the D-index. 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 MENA that can be used for comparison, which we show in Table 2.¹² We present estimates from studies for both early childhood care and education (ECCE) and primary completion (at least six years). ECCE had a D-index of 21.8% in Egypt, 24.4% in Jordan, and 25.5% in Tunisia. ECCE was notably the early childhood indicator with the highest inequality in the twelve early childhood development measures studied (El-Kogali and Krafft, 2015). In Morocco, one of the countries in the region struggling with enrollments, just 49.8% of youth finished primary school and the D-index was 17.7%, the highest of the six countries in the MENA region in that study (Krishnan et al., 2016). Looking at almost 50 developing countries throughout the globe (not shown), the highest D-index in primary completion was 43.5% in Niger, where only 10.4% of children complete primary (World Bank, 2016).

¹² As enrollments approach universal, necessarily the D-index decreases.

Table 2. Estimates of education D-indices in past studies

	<u>Early childhood care and education</u>		<u>Primary completion</u>	
	<u>% Enrolled</u>	<u>D-index</u>	<u>% Completing</u>	<u>D-index</u>
Djibouti	14.1	34.6		
Egypt	40.2	21.8	83.4	3.8
Iraq	3.8	43.5	80.6	5.5
Jordan	21.7	24.4	99.3	0.2
Libya	9.3	23.7		
Morocco	57.8	24.2	49.8	17.7
Syria	17.2	36.3		
Tunisia	44.5	25.5	73.7	6.5
West Bank and Gaza	34.1	12.1	90.0	1.9

Sources: El-Kogali & Krafft (2015) for ECCE except Morocco is El-Kogali et al. (2016). Primary completion from Krishnan, Ibarra, Naryan, Tiwari, & Vishwanath (2016).

With these reference points in mind, we can see from our D-index results in Table 3 that Egypt has high inequality in higher education. To create equal opportunity, 36.6% of opportunities to attain higher education would need to be redistributed. The two primary drivers of inequality in the Shapley decomposition are mother's education (27.2% of inequality) and father's education (42.3% of inequality). There are also smaller contributions from father's work sector and region. Jordan has less inequality of opportunity than Egypt. Jordan would need to redistribute 18.7% of opportunities for there to be equality of opportunity. The inequality in Jordan is primarily related to 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. Inequality is high in Tunisia, where 37.3% of opportunities to attain higher education would have to be redistributed 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. Across countries, sex contributes less than 3% to inequality.

Table 3. D-index for higher education attainment and Shapley decomposition of D-index (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
Born abroad		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

6.3 *The role of different background characteristics*

In this sub-section we examine the multivariate models, which incorporate all of the individual characteristics included in the D-index, as well as ten-year birth cohorts to model changes over time.¹³ Marginal effects (changes in probability) for these models are presented in Table 4.¹⁴ We also present figures with the descriptive, bivariate relationships between circumstances and higher education attainment.

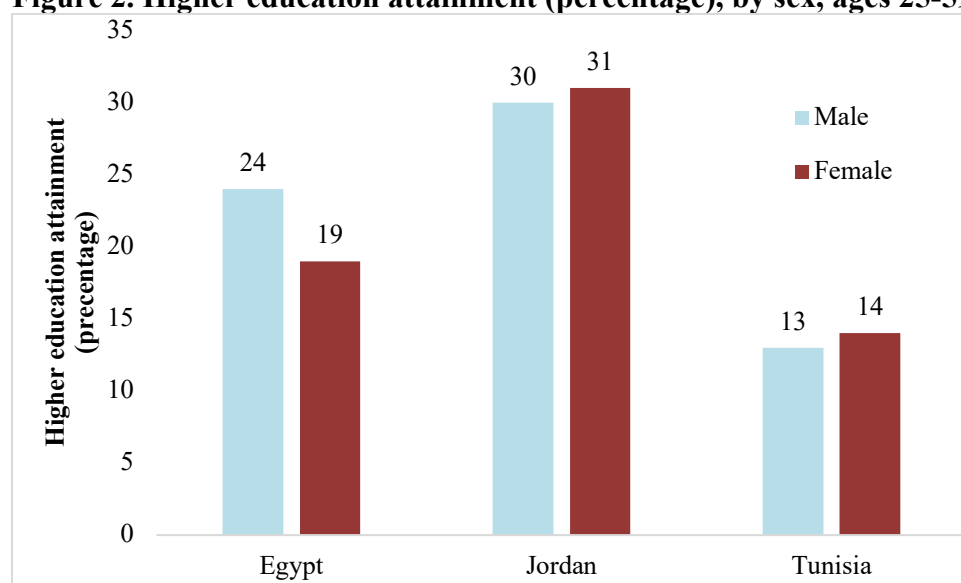
Across all three nations higher education attainment does not differ greatly by sex (Figure 2). In Egypt male attainment (24%) is greater than female attainment (19%). After controlling for other characteristics (Table 4), in Egypt females had a 5.3 percentage point (p.p.) lower

¹³ Results splitting the data into a younger cohort (25-39) and an older cohort (40-59) showed the D-indices are not significantly different across generations.

¹⁴ We tested incorporating interactions between sex and these characteristics, but few interactions were significant; the primary pattern was a decreasing gender gap in attaining higher education over time.

probability of attaining higher education than males. In Jordan and Tunisia female attainment is, descriptively, one percentage point greater than male attainment, but this difference is not significant after controlling for other characteristics.

Figure 2. Higher education attainment (percentage), by sex, ages 25-59

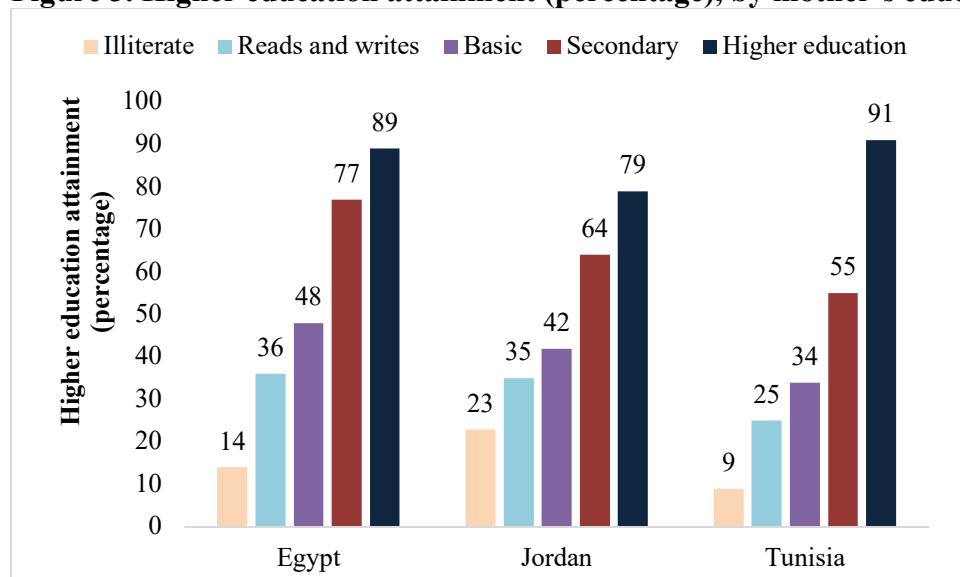


Source: Authors' calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

The three countries have similar relationships between attaining a higher education and mother's education (Figure 3). Mother's education positively affects higher education attainment even after accounting for other characteristics (Table 4). In Egypt an individual whose mother attained basic education has a 13.3 p.p. greater chance of attaining higher education 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 and Saleh, 2016). 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.

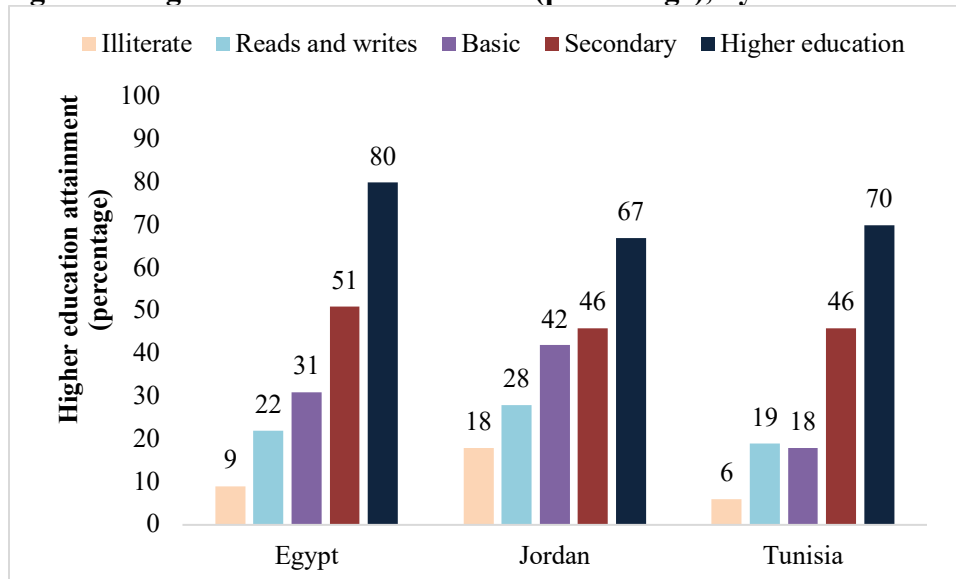
Figure 3. Higher education attainment (percentage), by mother's education, ages 25-59



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

Disparities by father’s education (**Figure 4**) are relatively smaller than those for mother’s education. After accounting for other characteristics (Table 4), father’s education is almost always significant. For example, having a father with higher education compared to an illiterate father increases the chances of attaining higher education by 31.5 p.p. in Jordan.

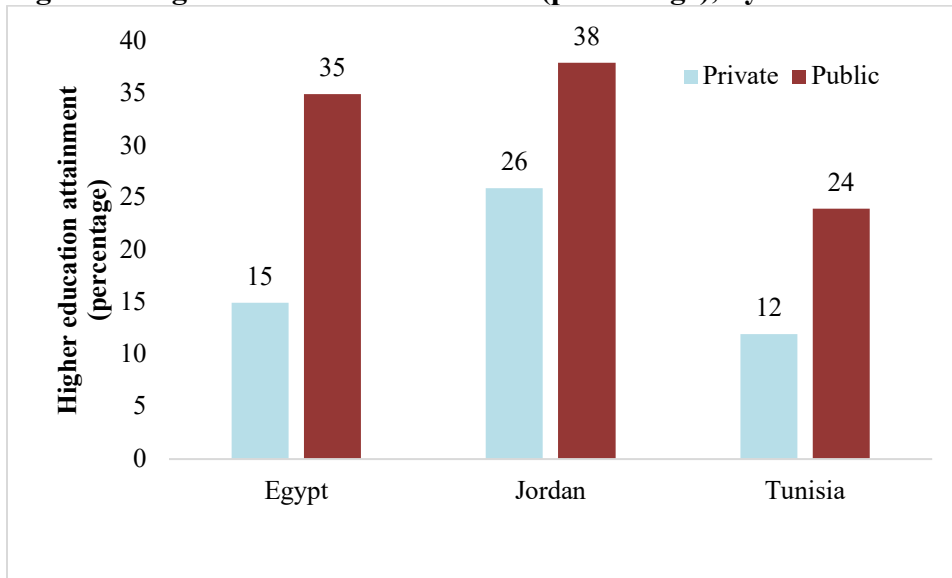
Figure 4. Higher education attainment (percentage), by father’s education, ages 25-59



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

In all three nations, father’s sector of work relates to higher education attainment (Figure 5). Those with fathers in the public sector have a higher likelihood of attaining higher education. After controlling for other characteristics (Table 4), father’s employment sector is only significant in Jordan, where it increases the chances of attaining higher education by 5.4 p.p. compared to having a father in the private sector.

Figure 5. Higher education attainment (percentage), by father’s sector, ages 25-59

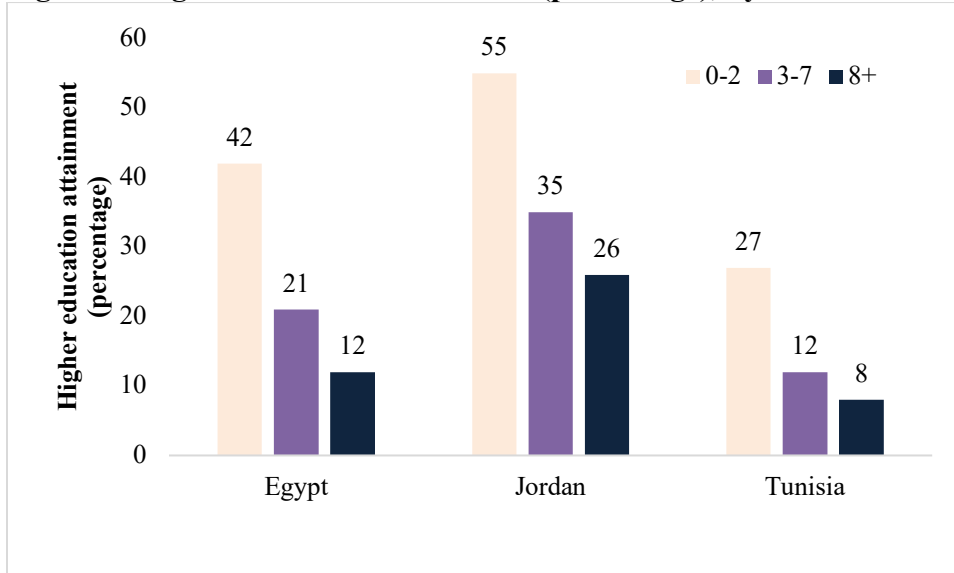


Source: Authors’ calculations based on ELMPS 2012, JLMPS 2010, and TLMPS 2014

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. Individuals from smaller families (with 0-2 siblings) have higher rates of higher education attainment than average in Egypt (42%), Jordan (55%) and Tunisia (27%) while those from larger families have lower chances of attending higher education (Figure 6). However, after controlling for other characteristics (Table 4), 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 significant.

Figure 6. Higher education attainment (percentage), by number of siblings, ages 25-59



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

Access to higher education is likely to be affected by the local availability of education. 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 are not available for Jordan,¹⁵ but there are differences in Jordan in terms of being born abroad; while 29% of those born in Jordan attained higher

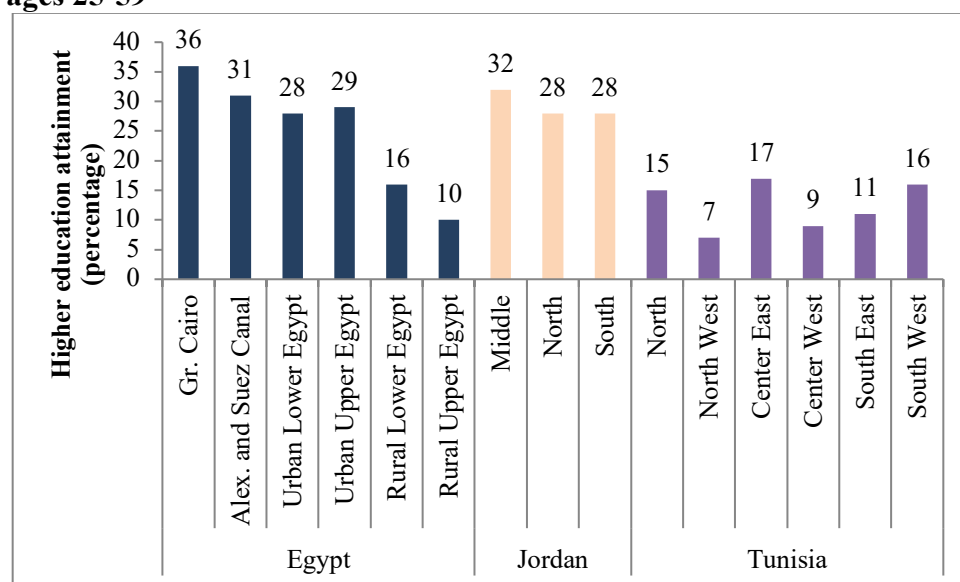
¹⁵ Additional analyses suggest that the resulting difference in the number of region categories across countries is not driving results.

education, 36% of those born abroad did so.¹⁶ 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 (Table 4). There are not significant differences by birth abroad for Jordanians.

Figure 7 shows higher education by childhood region of residence. There is relatively little inequality by region in Jordan. Disparities are much larger in Egypt and Tunisia. Only in Egypt, after accounting for other characteristics (Table 4), were there significant differences by region; originating from rural Lower Egypt predicts a significantly lower probability of higher education (-4.3 p.p.) as does originating from rural Upper Egypt (-8.8 p.p.).

¹⁶ Those born abroad in 2010 are primarily of Palestinian origin. This diaspora community has invested in education in part due to limited access to other opportunities (Alzaroo and Hunt, 2003; El-Said and Harrigan, 2009). As well as high in-migration, Jordan has high out-migration, with 4.9% of Jordanians abroad (Di Bartolomeo et al., 2010). The absence of this small group is unlikely to be driving results.

Figure 7. Higher education attainment (percentage) by region of residence (childhood), ages 25-59



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

After accounting for other characteristics (**Table 4**), trends by birth cohort largely coincide with Figure 1, 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.

Table 4. Logit model marginal effects for probability of attaining higher education, by country, ages 25-59

Coefficients are marginal effects, standard errors in parentheses

	Egypt	Jordan	Tunisia
Base case probability:	0.216	0.303	0.135
Sex (male omit.)			
Female	-0.053*** (0.007)	-0.005 (0.010)	0.005 (0.011)
Mother's education (illit. omit.)			
Reads and writes	0.108*** (0.013)	0.053*** (0.015)	0.014 (0.031)
Basic	0.133***	0.070	0.049*

	Egypt	Jordan	Tunisia
	(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) Middle (Jordan) North (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)

	Egypt	Jordan	Tunisia
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 abroad		0.028 (0.016)	
Childhood residence (urban omit.)			
Rural			-0.064*** (0.014)
N	19,499	9,113	4,947

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

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Base case probability is estimated at the omitted category for the categorical variables.

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 individuals' characteristics, and background may affect access to higher education even after accounting for test scores. We explore both these possibilities in Table 5. 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 stage is preparatory in Egypt and secondary (the baccalaureate exam) in Tunisia (Assaad, 2013; Ben-Ayed et al., 2016).¹⁷ This estimate 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,

¹⁷ Results (available from authors on request) using secondary scores in Egypt are substantively similar to the results presented here with preparatory scores.

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.

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. When including test scores in the logit model for higher education, although the effects of background are somewhat reduced compared with Table 4, they by no means disappear. 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. Thus, in both countries, as well as inequality mediated through test scores, background directly affects the chances of higher education.

Table 5. Regression models for test scores and logit model marginal effects for the probability of attending higher education (incorporating test scores), by country, ages 25-59, reached test score stage

	<u>Regressions for test scores</u>		<u>Logit marginal effects for higher education</u>	
	<u>Egypt</u>	<u>Tunisia</u>	<u>Egypt</u>	<u>Tunisia</u>
Base case probability:			0.392	0.567
Sex (male omit.)				
Female	0.053 (0.639)	0.036 (0.243)	-0.028* (0.012)	0.037 (0.037)
Mother's education (illit. omit.)				
Reads and writes	3.032** (1.157)	0.105 (0.465)	0.106*** (0.022)	0.049 (0.092)
Basic	2.589 (1.343)	0.456 (0.353)	0.137*** (0.033)	0.004 (0.051)
Secondary	7.680*** (1.310)	0.396 (0.547)	0.222*** (0.041)	0.186* (0.080)
Higher education	9.584*** (1.581)	0.435 (0.764)	0.266*** (0.061)	0.334*** (0.079)

	<u>Regressions for test scores</u>		<u>Logit marginal effects for higher education</u>	
	Egypt	Tunisia	Egypt	Tunisia
Father's education (illit. omit.)				
Reads and writes	0.534 (0.869)	0.255 (0.497)	0.074*** (0.020)	0.050 (0.062)
Basic	1.152 (1.084)	0.181 (0.335)	0.109*** (0.022)	0.087 (0.047)
Secondary	5.358*** (1.334)	0.633 (0.477)	0.179*** (0.033)	0.093 (0.072)
Higher education	8.031*** (1.311)	1.588* (0.620)	0.348*** (0.038)	0.058 (0.083)
Father's sector (private omit.)				
Public	-0.296 (0.709)	-0.129 (0.341)	-0.022 (0.016)	0.000 (0.051)
Number of siblings (0-2 omit.)				
3-7	-0.829 (0.693)	-0.436 (0.324)	-0.028 (0.020)	0.033 (0.049)
8+	-1.845 (1.084)	-0.173 (0.531)	-0.043 (0.026)	0.126* (0.060)
Birth cohort (1950-1959 omit.)				
1960-1969		-0.984 (1.317)		0.234 (0.120)
1970-1979	-1.666 (1.105)	-1.436 (1.250)	0.004 (0.021)	0.452*** (0.085)
1980-1989	-1.139 (1.227)	-0.687 (1.243)	0.066** (0.022)	0.550*** (0.081)
Childhood region (Gr. Cairo (Egypt) North (Tunisia) omit.)				
Egypt-Alx & Sz. Canal	-1.571 (0.979)		-0.003 (0.030)	
Egypt-Urb. Lwr.	2.986** (1.092)		0.032 (0.032)	
Egypt-Urb. Upp.	-0.991 (1.154)		0.056* (0.028)	
Egypt-Rur. Lwr.	-0.304 (1.036)		-0.012 (0.027)	
Egypt-Rur. Upp.	-1.995 (1.224)		-0.034 (0.030)	
Tunisia-North West		0.022 (0.390)		0.037 (0.068)
Tunisia-Center East		-0.139 (0.372)		0.040 (0.047)

	<u>Regressions for test scores</u>		<u>Logit marginal effects for higher education</u>	
	<u>Egypt</u>	<u>Tunisia</u>	<u>Egypt</u>	<u>Tunisia</u>
Tunisia-Center West		-0.386 (0.495)		0.082 (0.057)
Tunisia-South East		0.862* (0.367)		-0.016 (0.053)
Tunisia-South West		0.345 (0.513)		0.050 (0.089)
Childhood residence (urban omit.)				
Rural		-0.336 (0.261)		-0.001 (0.039)
Test score			0.017*** (0.001)	0.156*** (0.015)
Test score missing			-0.059*** (0.015)	-0.148*** (0.033)
Constant	70.576*** (1.380)	11.245*** (1.316)		
N	2,717	485	6,048	744
R-squared	0.195	0.134		

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

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Base case probability is estimated at the omitted category for the categorical variables and with test scores as observed.

In Table 6 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 6 with Table 3 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 “test score” 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, while Egypt and Tunisia have D-indices in Table 3 that are similar and around 37%, when restricting to the test score sample the D-index is 23.6% in Egypt and 10.7% in

Tunisia. Thus, more of inequality of opportunity in Tunisia is driven by what happens before, rather than at and after the test. Second, the D-index only increases a little with the addition of test scores in Egypt, from 23.6% to 29.1%. This modest increase suggests that scores have relatively little additional explanatory power for individuals' chances to attend higher education. 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 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 5.

Table 6. Incorporating test scores in the D-index for higher education attainment and Shapley decomposition of D-index (percentages)

	<u>Test score sample</u>		<u>Adding test scores</u>	
	<u>Egypt</u>	<u>Tunisia</u>	<u>Egypt</u>	<u>Tunisia</u>
D-index	23.563	10.739	29.060	22.485
Std. error of D-index	(3.713)	(6.715)	(3.404)	(7.079)
Shapley decomposition				
Sex	0.5	11.8	0.2	3.1
Mother's education	37.4	35.5	25.0	9.6
Father's education	41.0	29.2	27.7	7.3
Father public sector	7.4	5.6	4.4	1.4
Siblings	6.0	2.5	3.6	0.6
Rural		0.9		0.3
Region	7.7	14.6	4.4	3.6
Test score			34.6	73.9
Total	100.0	100.0	100.0	100.0
N (Observations)	6,048	778	6,048	778

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

7 Discussion & Conclusions

Whether or not young people in MENA, and around the globe, can attain a higher education shapes their entire life course, including transitions to work and family formation. Access to higher education is not, however, universally or equally available to all. This paper

demonstrated that there is substantial inequality of opportunity in attaining a higher education in Egypt, Jordan, and Tunisia. Tunisia and Egypt had the most inequality of opportunity, whereas Jordan was considerably less unequal. 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. Moreover, the inequality 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.

The main drivers of inequality were the same across countries: parental education. Future research on how to reduce inequality of opportunity should evaluate programs centered on parental education. Governments could 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 and Krafft, 2015).

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. Test scores mediated some inequality of opportunity, 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 a number of potentially important circumstances and this will bias inequality of opportunity estimates downward. 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, disparities by sex have decreased over time. The age restriction may also minimize issues that strongly affect younger generations. More difficult to measure aspects of social class and social connections may be increasingly driving inequality (Assaad and Krafft, 2014; Assaad et al., 2017a).

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. Free higher education is a regressive policy that primarily benefits the rich. The two countries that guarantee free public higher education, Egypt and Tunisia, have the highest inequality of opportunity. In contrast, in Jordan tuition provides around two-thirds of public universities' income compared to one-fifth of university income from government subsidies (Kanaan et al., 2010). While additional research on these links is needed, the observed relationship between free higher education and inequality is counter to expectations. As countries around the world debate policies to address inequality and promote access to higher education, free higher education should be viewed with caution.

One potential mechanism for free higher education contributing to greater inequality is that earlier levels of education are starved of resources when higher education is free. Egypt and Tunisia spend relatively more of their education funding on higher education.¹⁸ Because the

¹⁸ Tunisia spends 7.4% of GDP on education and 2.0% of GDP on higher education (Abdessalem, 2010). Egypt spends 3.4% of GDP on public education (El-Baradei, 2013) and 1.1% of GDP on higher education (OECD/The World Bank, 2010). In Egypt, the new 2014 constitution mandates spending 4% of GDP on education and 2% on higher education (Egypt State Information Service, 2014), which is likely to further exacerbate inequality. Jordan spends

basic education systems within these MENA nations are poor, families invest substantially in tutoring (Assaad and Krafft, 2015; Sieverding et al., 2017). Tutoring contributes to primarily rich students succeeding in school and benefiting from free higher education, as we demonstrated and others have discussed in MENA and other global contexts (Assaad, 2013; Psacharopoulos and Papakonstantinou, 2005). Globally, countries that concentrate education spending on the higher education level have more inequality when expansion or “massification” of education occurs (Gruber and Kosack, 2014). As a result, education continues to reproduce social stratification rather than generate social mobility (Marginson, 2017; Morley et al., 2009). This pattern suggests that nations attempting to increase access to higher education should allocate more of their education budget towards basic education to promote equality of opportunity throughout the education system, even in higher education. Expanding access to pre-primary education in particular may reduce school readiness disparities (Krafft, 2015).

Instead of offering free higher education, countries, including 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 best design for a national need-based policy in a developing country context, including communicating this option to young people, is an important area for future research. However, these interventions in higher education funding can only help inasmuch as students complete all stages of pre-university education.

Ultimately, the inequality in higher education is linked to inequalities throughout societies. In MENA, inequality in early childhood development, basic, and secondary education

around 4% of GDP on public education and 0.8% of GDP on public higher education (Kanaan et al., 2010).

contributes to inequality in higher education (Assaad and Krafft, 2015; Assaad et al., 2014; El-Kogali and Krafft, 2015; Salehi-Isfahani et al., 2014). In turn, inequality in higher education affects labor market outcomes, particularly access to good jobs, and socio-economic mobility (Assaad and Krafft, 2014). Policies that make higher education attainment more equitable can help reduce a wide array of inequalities.

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