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QUALITY AND INEQUALITY IN ARAB EDUCATION:

A COMPARATIVE STUDY OF SCHOOL RESOURCE DISPARITIES

IN THE MIDDLE EAST

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Samira Halabi

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The dissertation of Samira Halabi was reviewed and approved* by the following:

David P. Baker
Professor of Education and Sociology
Dissertation Advisor
Chair of Committee

Katerina Bodovski
Assistant Professor of Education

Liang Zhang
Assistant Professor of Education

Leif Jensen
Professor of Rural Sociology and Demography

Gerald LeTendre
Department Head
Education Policy Studies

*Signatures are on file in the Graduate School

ABSTRACT

This study is a comparative analysis of school resources in 10 Arab countries (Saudi Arabia, Kuwait, Bahrain, Oman, Qatar and Lebanon, Syria, Jordan, Egypt, and Palestine). I address two main questions. First, what are the average levels of educational resources available to Arab students (Gulf & Mashrek), and how do these levels compare to countries with better educational outcomes? How do they compare to other countries with similar educational outcomes? Second, how are material, human, and curricular resources distributed across different types of students (girls vs. boys, richer vs. poorer, and public vs. private)? How do patterns of distribution differ across these groups? I use nationally representative data from the 2007 Trends in Mathematics and Science Study to determine interregional and within country differences in school resources. Specifically, I use the eighth grade mathematics achievement data to determine what resource differences exist and to test whether those difference are statistically significant. On average, compared to their OECD counterparts, Arab eighth graders experience shortages in several school resources, including instructional resources, instructional time, and teacher experience. Within the Arab region, eighth graders in the oil-rich countries around the Persian Gulf attend schools with less adequate instructional resources and school infrastructure, have less experience teachers, but spend a higher proportion of instructional time on math as compared to their counterparts in the Mashrek, the less rich Arab countries around the eastern Mediterranean. The findings showed a reverse gender gap in achievement, benefitting girls, and few differences in resources by gender. Sectoral differences are a major source of inequality, explaining ten to twenty percent of the difference in achievement. Public school students from lower socioeconomic backgrounds attend schools with fewer material resources. Because it is often the most disadvantaged students who attend public schools, these findings cast doubt on the potential

effect of schooling on social mobility and stratification. While the cross-sectional nature of the data precludes making causal arguments, findings suggest direction where future research will help policymakers identify areas for intervention to create more equitable educational environments for the region's youth. Specifically, research on the use of resources in the classroom, on the benefits of single-sex schools in the region, and on teacher practices are areas where further study can provide valuable information on raising the quality and reducing the inequality in Arab education.

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Chapter 1

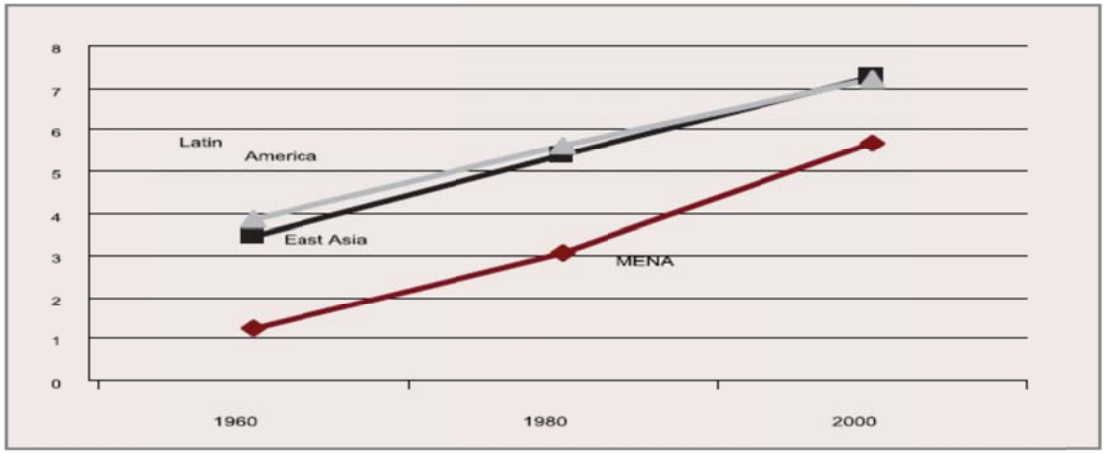
Introduction

This is a comparative study of the quality of and inequalities in education in ten Arab countries in the Middle East, including five oil-rich countries (Saudi Arabia, Bahrain, Kuwait, Qatar, and Oman) and five other countries (Syria, Jordan, Lebanon, the West Bank & Gaza, and Egypt). Using data from the 2007 Trends in International Math and Science Study (TIMSS), this inquiry is composed of two main analytic sections that together encompass both the resource inputs to and the achievement outcomes of schooling in the region. To understand what the relative levels of school resources in the region are, I first compare the average levels of school resources available to eighth grade students in Arab countries to a) students in OECD countries and b) students in middle- to low- income countries. School resources include material, human, and curricular resources that are often linked with student achievement. Second, to measure relative resource inequality, I look within each of the Arab countries to analyze the differences in the distribution of these resources across different types of students: girls vs. boys, high vs. low socioeconomic status, and public and private school students. In subsequent chapters, I present detailed findings for each of these main sections, showing how the results either confirm or refute commonly held beliefs about education in the region. In this chapter, I will outline the background of the study, present the research questions that guide it, describe the Arab context, and discuss the importance of the study in light of the existing scholarship on Arab education.

Background

In general, the Arab countries are credited with quickly adopting the worldwide model of mass schooling and expanding access to schools. Figure 1.1 shows that average years of schooling in the region started from a relatively low point, but has risen quickly to match that of other world regions. An overwhelming majority of youth in the region at both the primary and secondary levels are enrolled in school. Access to schooling, as shown in the net enrollment rates in Table 1.1, does not represent a challenge in many of the Arab countries; at the primary levels as it is almost universal. At the secondary levels, the net enrollment rates are comparable to other world regions, such as Latin America and the Caribbean and East Asia, and gender parity has been reached (and often exceeded) in a few countries. In many cases, investment in education has also matched or exceeded spending on education in other world regions. Researchers (Shafik 1996, Tansel & Kazemi 2000, Rugh 2002, Benard 2006, World Bank 2008) point to patterns of high government spending on education, with Middle Eastern countries spending almost as much on education as a percentage of GDP as the developed industrial countries. Average spending on education from the 1970s to the end of the century was 4.73 percent, higher than the world average of 4.1 percent and the low- and middle-income country average of 3.64 percent (Benard, 2006). The World Bank also reports similar figures for spending. Table 1.2 shows that on average, Arab countries spent 5.3 percent of GDP on education, compared to 3.6 for the East Asian countries, and 3.9 percent for Latin American countries.

Figure 1.1 Mean years of schooling completed among adults in the Middle East and North Africa (MENA) and other world regions.



Source: Bibi & Nabli, 2010

Table 1.1. Net school enrollment for selected countries in the Arab world

Country	Primary			Secondary		
	Male	Female	Total	Male	Female	Total
Bahrain	98.2	97.4	97.9	87.2	91.7	89.4
Egypt	95.5	91.7	93.6	73.2	69.2	71.2
Jordan	88.3	90	87.3	83.1	84.4	83.7
Kuwait	88.6	86.6	87.6	79.6	80.2	79.9
Lebanon	88.7	88	88.3	70.8	78.5	74.6
Oman	67.4	69.2	68.3	78.6	77.8	78.2
Palestinian Territories	73.2	73.5	73.3	86	91.3	88.6
Qatar	94.6	93.6	94.1	66.8	98	79.2
Saudi Arabia	85.1	84	84.5	70.3	75.8	73
Syria	97	91.9	94.5	68.4	67	67.7

Source: Dyer, 2010.

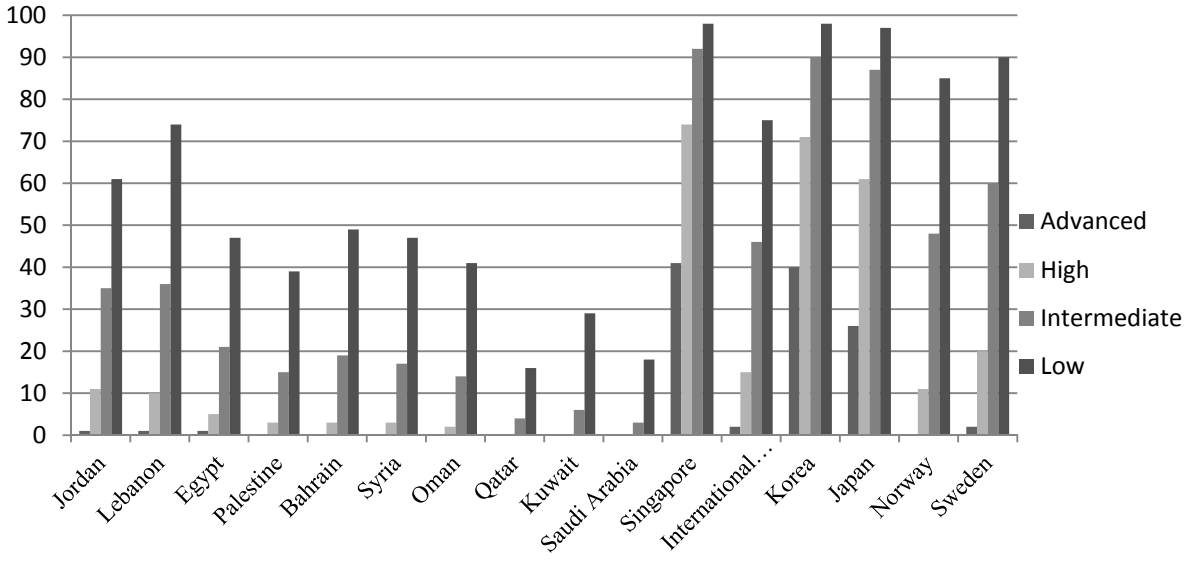
Table 1.2 Average of public expenditure in education as a percentage of GDP, 1965-2003

	1965-74	1975-84	1985-94	1995-2003
Bahrain	-	3.3	4.1	3.6
Egypt	4.7	5.4	4.8	5.6
Jordan	3.2	5.2	6.1	6.4
Kuwait	-	4.1	7.1	6.3
Lebanon	-	-	2	2.9
Oman	-	2.1	3.6	3.9
Qatar	-	3.6	4	-
Saudi Arabia	3.6	6.7	7.2	6.3
Syria	3.3	5.4	4.3	3.2
West Bank & Gaza	-	-	-	9.5
Mean	3.7	4.48	4.8	5.3

Source: World Bank, 2008.

Despite increased enrollments and spending, educational outcomes in the region are often poor, characterizing the pattern as one of "big spending, small returns" (Shafik 1996). If the return on investment to education can be measured in cognitive skills acquired, which in turn can be measured by achievement on international assessments, it appears that Arab nations are getting low returns on their investments. The most recent comparative achievement data from the 2007 TIMSS clearly illustrate the problem of low performance. The average TIMSS score is 500, with a standard deviation of 100. Figure 1.2 shows the proportions of students in each country reaching low, intermediate, high, and advanced benchmarks. In Saudi Arabia for example, 18 percent of students reached the low benchmark (400) points, and 3 percent reached the intermediate benchmark. The remaining 82 percent did not even reach the low benchmark, which is marked by students having some knowledge of whole numbers and decimals, operations, and basic graphs. The pattern for the other Arab countries, although not quite as bad, is similar in that high proportions of students do not reach even the low benchmark. In contrast, in Singapore, the highest performing country, 98 percent of eighth graders reached the low benchmark, of that 98 percent, 92 percent reached the intermediate, 74 percent reached the high benchmark, and 41 percent reached the advanced benchmark. This depiction alone is alarming, and calls for deeper investigation into the inputs and outputs of the educational systems in the region.

Figure 1.2 Comparing Arab and selected OECD countries performance by proportion of students reaching TIMSS 2007 benchmarks



Source: TIMSS 2007 International Report

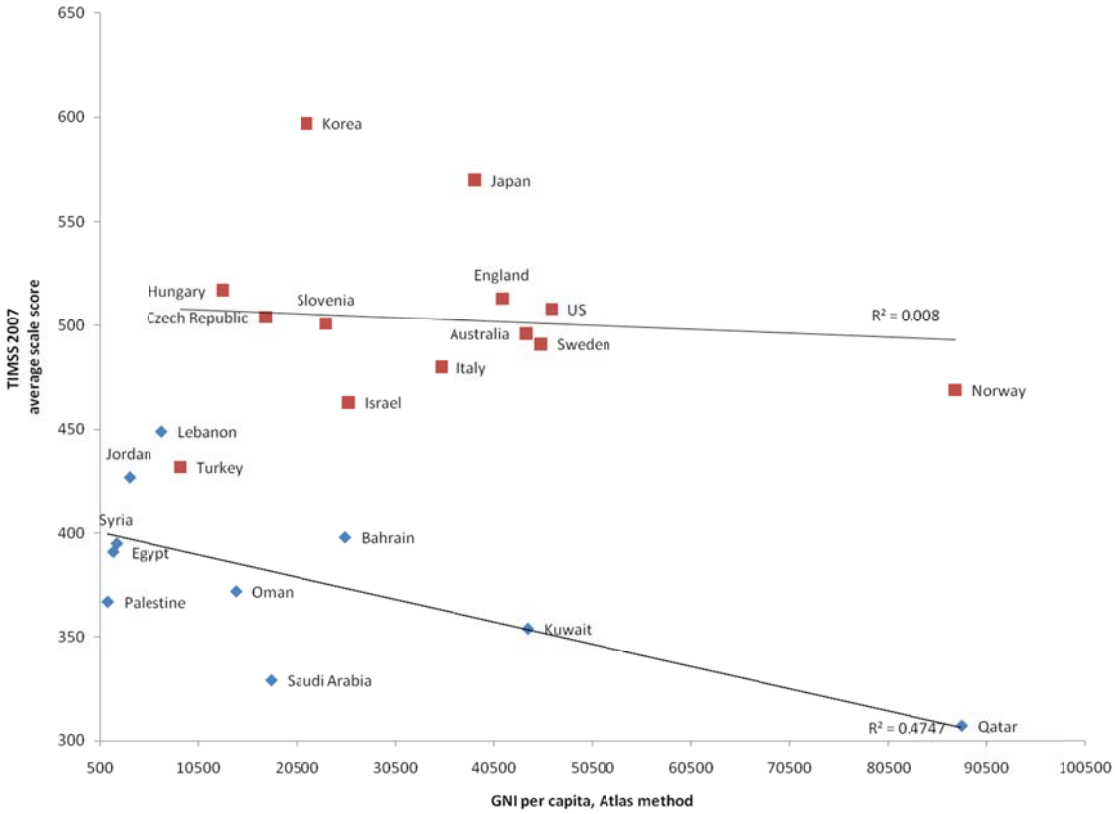
Taken from a human capital perspective, education enhances cognitive and other skills, which in turn, contribute to the productivity of labor, economic growth, and development (Becker, 1993). However, despite considerable investment in education in the Arab world, human capital formation has not followed predicted patterns; productivity and economic growth are comparatively low. For example, expenditure on research and development, the number of scientific publications, and the number of patents in the Arab states are the lowest in the world (World Bank, 2008). Gary Becker (2000) offers this analysis:

> it is a fact that human capital is absolutely essential to growth in the modern world. The very few Arab sheikdoms that make their income off from the high price of oil are the only exceptions to the rule that human capital, investments in people, are an essential ingredient to economic progress. I do not think there is any exception to that rule aside

> from the few oil producers. Fortunately, most countries do not have this large supply of oil, and cannot rely on it —most countries that have a large supply of oil are wasting their resources.

Becker's provocative statement points to two major issues pertinent to the discussion of education in the Arab world: 1) the presence of oil, and its assumed effects on education, and 2) the idea that investments in education are wasted. In fact, the relationship between resources and outcomes in the Arab region is peculiar. As figure 1.3 shows, TIMSS achievement in the Arab countries (indicated by diamonds) decreases as national income increases, much unlike the case for the OECD (indicated by squares) countries, where that relationship is weak to nonexistent.

Figure 1.3 The relationship between Gross National Income and achievement in select Arab and OECD countries



Research Questions

The regional pattern of low achievement raises questions about the quality and distribution of schooling inputs, such as teachers, teaching practices, school facilities, textbooks & curricula as suspected factors in the low achievement. Compounding the problem of low achievement are economic, social, and political characteristics of the region that can be seen as hampering educational efforts, including inequalities based on income, expenditure, gender, class, and place of residence. To gain a better understanding of the relationships of educational inputs to outcomes, and of the extent of inequality of educational opportunity present in the Arab countries, this dissertation proposes to answer the following sets questions:

1) What are the average levels of educational resources available to Arab students, and how do these levels compare to countries with better educational outcomes? How do they compare to other countries with similar educational outcomes?

2) How are educational resources distributed across different types of students—boys and girls, students from high and low socioeconomic backgrounds, and public and private school students?

Weak educational outcomes pose a threat to the social and economic progress of nations and communities in the Arab world. The poor quality of education in the Arab world has garnered much attention post-9/11 as the internal affairs of Middle Eastern countries have come under increased international scrutiny. While the classification of "Arab world" has sometimes encompassed all countries of the Middle East and North Africa and beyond, including Turkey, Iran, Sudan, Chad, and Mauritania. My analysis is limited to a set of ten Arab countries including the *Mashrek* countries around the Eastern Mediterranean Sea (Lebanon, Syria, Jordan, Palestine, and Egypt) and those around the Persian Gulf (Bahrain, Saudi Arabia, Kuwait, Qatar, and Oman). The economies and cultures of this group of countries are more closely interconnected with each other than with the Maghreb countries of northwest Africa, which are excluded from the present study.

Although few empirical studies attempt to seriously document and analyze the regional educational environment in detail, existing accounts concur that the general quality of schooling in the region is poor (for examples, see UNDP 2009, World Bank 2008, Heyneman 1997). The consensus among academic and other researchers is that public schooling in the Arab countries is inadequately preparing students to think critically and to solve novel problems, prerequisites for

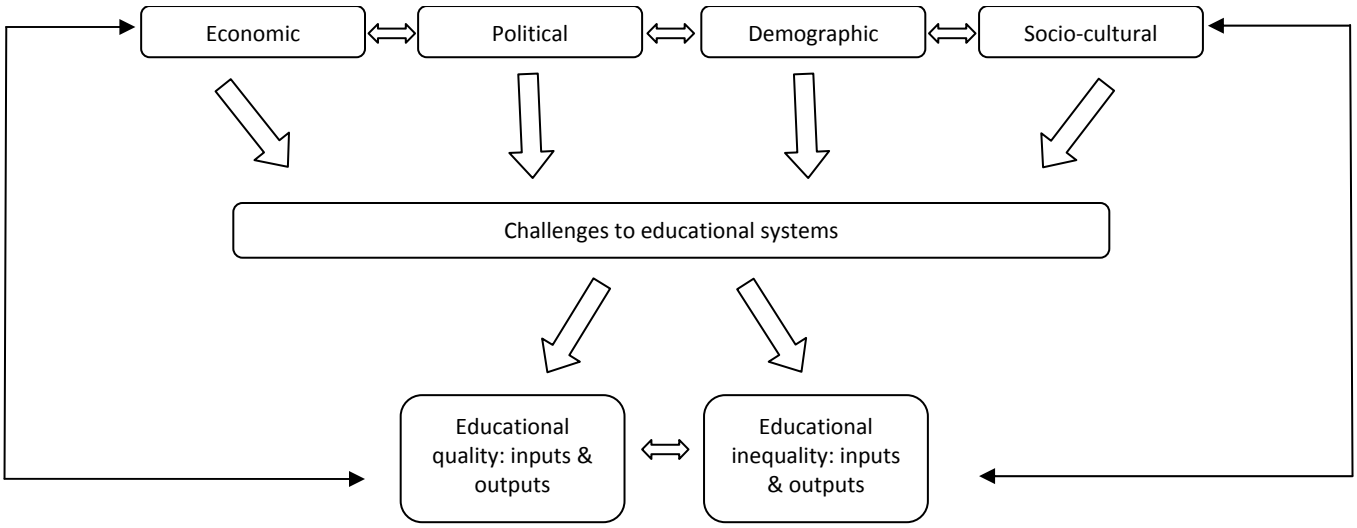
success in 21st century (Nour, 2005; Lord, 2009; Gonzalez, 2008; Hanouz & Khatib, 2010). This general underperformance is disconcerting, especially when taking into account the vast financial resources available in the region on one hand, and the demographic and economic challenges the region faces on the other.

The Arab Context

Several characteristics of the region are particularly important for understanding the context in which educational institutions operate. Significant sub-regional differences exist, and the study differentiates among the oil-rich Gulf countries and the Mashrek countries. Lebanon, Syria, Jordan, Egypt, and Palestine—countries of the Eastern Mediterranean—developed quite differently from Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman—the oil-rich Persian Gulf states Arab countries have relatively short histories as independent nation-states in the modern sense. Most have been controlled to varying degrees by foreign powers—British, French, and Ottoman—but the exact arrangements differed country to country.[1] While recognizing that discussion of the "Middle East" masks important historical, geographic, and cultural differences among individual countries, a detailed analysis of the nuances is beyond the scope of this study. Qualitative and quantitative country characteristics among the nations are summarized in Appendices A and B. The following sections describe the Arab context, detailing the specific the interrelated demographic, economic, political, and socio-cultural features that pose challenges to national educational systems in the region. Figure 1.4 provides the framework that structures the following discussion.

[1] While the United Arab Emirates is part of the oil-rich Persian Gulf region, the participation of Dubai—one of the emirates—in TIMSS 2007 was as a benchmarking participant only and results are neither nationally representative nor generalizable. It is excluded from this study.

Figure 1.4 Factors specific to the Arab context that pose challenges to educational quality and equality



In modern history, one of the most significant drivers or large scale social change has been the discovery and subsequent production of oil in the region after the Second World War. The revenue generated from increases in oil production and prices have been noted by some to be the trigger for the "new Arab social order" (Ibrahim 1982), characterized by the movement of manpower and money across country borders, and heavy reliance on migrant Arab labor. Oil's impact was felt not just in the oil-rich countries, but for the entire region as Lebanese, Syrians, Palestinians, and Egyptians and others found well-paying jobs in Saudi Arabia, Kuwait, Qatar, and the United Arab Emirates. The number of Arabs working in the Gulf increased from half million in 1973 to 2 million in 1985 (Golladay et al. 1998); in mid-1970, migrant labor contributed half of all the actively employed in the capital-rich Arab countries (Ibrahim 1982, 36). Economies of labor-exporting countries were stimulated by the inflow of worker remittances, but the growth of oil wealth was not immediately accompanied by socioeconomic-political development. Inter- and intra-Arab inequalities grew, as did dependence on the West (Ibrahim, 1982). The changes resulting from a relatively rapid transition from a rural and tribal way of life to an urbanized and more modern structure had political, demographic, and social

repercussions that continue to interact to pose challenges to educational systems (Davidson, 2008). The following section will discuss these challenges.

An overreliance on oil in the Gulf nations has led to underinvestment in other productive sectors, a trend towards consumption that has not created productive jobs, and the undervaluation of knowledge; access to wealth, rather than through scholarship and intellectual pursuits, is the path to advancement (UNDP 2009). As an indicator of the deficiency in 'intellectual pursuits' labor economists have pointed to the mismatch between both the quantity and quality of those entering the labor markets and the quantity and quality of the jobs available (Golladay et al. 1998, Gonzalez et al. 2008). This mismatch has created concern for the region's youth, because as the economies move away from natural resource extraction as the sole source of revenue, success will depend on a well-trained and highly flexible labor force that be creative and productive (Golladay et al. 1998).

Observers have characterized the region as suffering from the 'paradox of plenty', or a 'rentier mentality'. A rentier has been described as a member of a special group who, though s/he does not participate actively in the economic production, receives a share of the produce. The distinguishing feature of the rentier is the lack of a productive outlook in economic behavior, embodying a break in the work-reward causation (Beblawi 1987) which is associated with "a serious blow to the ethics of work" (62). Rather than associating reward with work or effort, the rentier associates income or wealth to chance or situation. The region as a whole, oil rich and oil poor, has been described as an economy with various undertones of rentier mentalities (Beblawi 1987, 52; Rivlin 2009). The pattern described above is not exclusive to the oil-rich Arab countries. More generally, Birdsall (2001) argues that predominant development strategies adopted in resource abundant countries do not raise the rate of return to human capital

investment. Birdsall (2001) describes how in resource abundant countries, the role of the government can easily become exclusively a provider of welfare goods, with the poor as beneficiaries. The government's role becomes one of regulation of the extraction of resources, and distribution of the returns to the people "through make-work jobs or inefficient development projects. The government becomes Santa Claus, dispensing its largesse on the people, who in consequence demand more and more" (Birdsall et. al 2001, 69). Overreliance on rents from oil has affected not only the economy, but also the role of the state in the whole Arab world.

In general, the region's historical and cultural tradition lacks a well-articulated theory of checks and balances (Waterbury 1998), and governments have seldom been accountable to their citizens. Oil resources relieved many governments of the need to tax their citizens and allowed them to redistribute substantial resources through vast welfare and social services programs. At the same time, this system of widespread redistribution of wealth reduced demands from Arab citizens for accountable and inclusive public institutions. As a result, politically, most Arab governments have lacked contestability and inclusiveness, reflected in rural/urban inequalities in access to public services, gender inequalities in voice and participation in society, and in nepotism or patronage determining who gets public services or access to lucrative business opportunities and who does not (Rivlin 2009). Resource abundance has been negatively associated with political liberties, civil liberties, bureaucratic quality, and rule of law (Woolcock, Pritchett, and Isham 2001).

An example of the lack of accountability and inclusiveness in education comes from the former director of Lebanon's Educational Center for Research and Development. In his account of curriculum development in Lebanon, Nemer Frayha notes that "parents, students, and other stakeholders are rarely given the opportunity to monitor, question and challenge the performance

of the Ministry of Education, despite the fact that such a right is embedded in the country's constitution... This lack of accountability leaves the door open…for personal rather than public interests to prevail" (Frayha 2010, 97). Despite the lack of accountability, however, Arab governments have established all kinds of modern institutions, which have also been described as flawed (Cook, 2005). Cook argues that the institutions have been designed to ensure the authoritarian nature of the regimes: "Arab states boast such institutions in spades; the problem is not with their number but with their nature" (96). Clearly, with the uprisings that have been transforming the region since late 2010, citizens have begun to challenge the status quo. The wide spread of the uprisings has been linked to the region's high proportion of young people.

Demographically, the Arab region is the second youngest region in the world, after sub-Saharan Africa, with around 52 percent of the population under the age of 15. Because of the increasing numbers of school-age children, governments will have to spend more just to maintain same level of quality. In addition, the youth bulge witnessed now has implications for the capacity of nations to ensure employment and social security in the future (Winckler 2002). In Syria, for example, the number of those entering the workforce during the period of 2016-20 will be almost four times higher than the number of those retiring in the same years (Winckler 2002). This demographic trend is seen by some as a cause for alarm, and not as a boon, because of the high rates of joblessness and low rates of job creation: "it is difficult to imagine how a large number of poorly educated and completely unskilled youth who have no acquaintance with the disciplinary strictures of the work ethic can be presented as a favorable phenomenon" (Chaudhry, 2007, 18). For education in the Arab region, this demographic trend has serious implications as schools, faced with stagnant budgets, have to spread resources over larger numbers of students. There is some evidence to show in countries where the fertility rates have

fallen, the demographic dividend (a decrease in the dependency ratio, which is the number of people under fifteen and over sixty-five divided by the working-age population) may already be in effect as the rate in increase of new school entrants slows down (Richards and Waterbury, 2008).

Another defining feature of the region is the prevalence of Islam as the major religion practiced by most of the area's inhabitants. A comprehensive account of the influence of Islam on the region's political and economic trajectory is beyond the scope of this study. What is important to note about Islam in the discussion of educational quality concerns the pedagogical practice associated with learning the Quran. Rote memorization of this religious book was and continues to be standard practice in religious schools and classes. Until the establishment and spread of modern systems of schooling in the early 20th century, this type of religious education, highly dependent on committing passages to memory, was prevalent. Despite efforts to modernize teaching practices and reform pedagogy away from rote memorization towards more progressive techniques, rote memorization remains a feature of teaching and learning in the region.

The Quality Problems of Arab Education

The intersections of these economic, demographic, political and social contexts pose a set of unique challenges to the success and effectiveness of modern education systems in the region. Studies on the quality of education in the Arab countries have generally pointed to similar basic problems afflicting systems of national education, pointing to descriptive data on schooling inputs, such as government expenditures, and outputs, such as scientific publications. The

consensus is that public schooling in the Arab countries is inadequately preparing students to think critically and to solve novel problems, prerequisites for success in 21st century.

In discussions of Arab education, poor quality has been a salient feature since the earliest days (for the earliest historical accounts, see Trial & Winder, 1950; Matthews & Akrawi, 1949), and various sources of inequality afflicted educational systems. As early as the 1960s, Wheeler (1966) suggested that the biggest challenge for the region would be in designing a curriculum that integrates religious, scientific and technical education. At that time, Arab countries were using colonial models of education, long after the colonizers had moved on and improved and updated their curricula. The colonial powers left behind a structure that would perpetuate inequalities. Richards & Waterbury (2008) and El-Ghonemy (1998) describe how schools established by colonizers were accessible only privileged children of rich natives who could afford the high fees and who were politically friendly to the colonial administration. These secondary schools aimed to produce the clerks necessary to staff the colonial administration and the banks and business that sustained the economic links between the colony and the city. The colonial authorities used the educational system as an instrument to bestow favors on select groups. While these quasi-foreign schools made significant contributions to the intellectual life and development efforts, they also exacerbated divisions among social strata. The advantage of the richer children gave them a much higher lifetime earning power. In addition, early in the 20th century in Egypt, even the government established schools created barriers to low-income families by charging fees and requiring Western style uniforms (El-Ghonemy 1998, 41). In addition, early rural-urban inequality stemmed from shortages of finance, buildings and teachers, making education more readily available to those who live in cities and the towns or larger

villages. Teacher recruitment and preparation in math and science was also a problem, especially in the oil-rich countries (Wheeler 1966).

More recently, descriptions of what ails educational systems in the Middle East have ranged from administrative structures centralization to poor teacher preparation. Originally set up to centrally manage economic growth and ensure a supply of government bureaucrats, educational structures remained stagnant and continued to allocate resources inefficiently by regulating occupational choice (Heyneman 1997). Matthews & Akrawi, writing in 1949 for a State Department-commissioned study on education in Arab countries of the Near East, anticipated that these highly centralized systems would impede future educational development. The World Bank (2008) report, 60 years later, reports a similar observation. Poor preparation of the teaching force is also cited as another reason for poor quality (Heyneman 1997). Tied to the preparation of teachers, traditional pedagogical techniques are often implicated in the discussion of poor quality education (Richards and Waterbury 2008, Rugh 2002, Benard 2006, World Bank 2008). Pedagogy in the region is said to be typically based on more rote learning, as it mimics traditional Islamic schools where parts of the Koran are memorized, than it is on critical thinking, problem solving skills, analysis of information, and learning how to learn. Few studies, however, provide qualitative or quantitative evidence to support the claim. In addition, sub-regional patterns of teachers from poorer Arab countries moving to work in the richer oil-exporting countries—where they can make at least ten times their domestic salaries—pose challenges for maintaining and advancing national teaching forces. Given this complex context, an examination of school resources in the region is necessary in beginning to understand the potential deficiencies in schools.

Contributions of the study

The component parts of this comparative study make a contribution to the intersection between two research areas: 1) the scholarship on Arab education, and 2) the literature on educational inequalities.

In general, existing studies on Arab education tend to be highly descriptive. Part of the reason for the shortage of high quality studies is the absence of reliable data. One early example of the descriptive type of research is Qubain's *Education and Science in the Arab world* (1965), which is a study of manpower resources and consists chiefly of descriptions of higher education administrative structures, enrollments by field in higher education, number and types of degrees awarded by different colleges, but it noticeably lacks an analytical, substantive discussion of regional trends and patterns. Later, Massialas & Jarrar (1991) piece dispersed data from various sources to assess policy issues: administration, structure, financing, student flow, curriculum, teacher training, vocational and technical education, higher education, the education of women, and nonformal education. They conclude that "traditional rather than transformational structures seem to prevail, delaying opportunities for… change. [E]ducation remains relatively stagnant" (11). Echoing this sentiment in another assessment, Jreisat (1997) shows that while the numbers of students, schools, and budgets tell a quantitative success story, the picture changes when qualitative considerations of quality enter into the analysis: "Despite…quantitative growth of education in the Arab world, the balance sheet reveals impediments and substandard outcomes" (p. 53). While these works discussed salient educational issues, the lack of reliable comparative data was a major limitation. Building on some of these ideas by using TIMSS data to describe educational inputs in detail, and juxtaposing the educational environment against in

the Arab countries to that in the OECD countries, this study provides a rich, detailed, and comparative description of the educational inputs that have been linked to achievement.

The second area to which this study makes a contribution is to the literature on educational inequality. In their review of education and stratification in developing countries, Claudia Buchmann and Emily Hannum (2001) note that research on the Middle East is noticeably absent and has been limited in this field. An older review of Arab sociology also noted the lack of serious efforts in the study of social stratification (Sabagh & Ghazalla 1986). Bibi and Nabli (2010) note that while high expenditures on social services such as education, health, and other infrastructure have helped to achieve large access gains and poverty reduction, inequality is seldom analyzed in these areas. Beyond income, they find that the little evidence available on inequality in the distribution of other variables—education, health, and land—suggests that the Arab countries are among the most unequal. Very little work has been done to provide a broader and fuller picture of inequality based on non-income dimensions across Arab countries. "Knowledge about alternative…aspects on inequality such as…equality of opportunity is almost nonexistent" (Bibi & Nabli 2010, 31). They also note that research has been very limited with respect to the distributional impact of public expenditures on achievements in education and health, especially in terms of their effect on equality of opportunity (Bibi & Nabli 2010, 83). Breen & Johnson (2005) also highlight two areas where the field of research on inequality of opportunity can be developed. As a first step towards explaining the origin-education association, they recommend producing an exhaustive list of the set of family resources and institutional factors that impinge on the opportunities of children, and to measure their relative importance in particular societies. They also point to a potential to increase the use

of existing comparative data sets collected for studies of educational achievement, such as TIMSS.

These studies, taken as a whole, point to a real gap in knowledge about educational inequality in the Arab countries of the Middle East. Virtually no study has examined inequality or distribution of educational opportunities for students of different socioeconomic backgrounds. This research will fill several of the gaps identified above. In terms of research on Arab education, this analysis will be the first to use nationally representative comparative data for 10 Arab countries to 1) determine the levels of resources across schools in the region and 2) examine the distribution of these inputs among different types of students. By analyzing the educational opportunity gaps in ten Arab countries, including ones where little is known about inequality levels, my proposed study will contribute to the understanding of existing disparities in education. While the cross-sectional nature of the data precludes making causal arguments, findings will reveal areas where policymakers can intervene to create more equitable educational environments for the region's youth.

Chapter 2

Literature Review

Although the quality of formal education is widely identified as important for human capital and political development, the exact factors in a school system that are most responsible are widely debated. 'School resources' has served as an umbrella term which has included material and human resources, including class size, teacher education, textbooks, and peers. The low achievement levels in the Arab countries prompt the question of whether the low achievement is tied to low levels of resources. In this section, I describe the main works that have motivated my examination of school resources in the Arab countries. As the review shows, evidence on the relationship has been mixed, and studies that use countries from the developing world have not often included Arab countries. In addition to a review of school resources literature, I review analyses of educational inequality and studies of the relationship between educational quality, inequality, and growth. I summarize what is known about these relationships in the Arab context, explain how they collectively inform my research questions, and how my proposed study adds to the understanding of education in the Arab world specifically.

2.1 School Resources

The international literature has not yet reached a definitive conclusion on which school resources matter most and to what extent they matter. Even in the international literature, the Arab countries are not represented as a group—in a few instances, one or two Arab countries are included in the group of countries selected. School resources and their effects have been a topic of education research since the well-known Equality of Educational Opportunity Study (Coleman 1966). The Coleman report was the first of its kind and found that school inputs had

little measurable impact on achievement. Differences in family background explained most of the variance in student achievement. Replicating the Coleman study in developing African nations, Heyneman & Loxley (1983) found that the portion of variance in achievement attributable to family background was much smaller in developing countries, and that attributable to school quality—measured in resources—was much larger. This finding was evidence for the relative importance of schools in poor countries. Baker et al. (2002), using multilevel modeling procedures, later found that the Heyneman-Loxley effect was reduced as most nations had adopted mass schooling, and that there was no association between national wealth and the size of school effects. Like Baker et al., Hanushek and Luque (2003) found that school impacts do not vary systematically with country income or development: "the overall strength of resources in obtaining better student performance seems rather limited...It does not appear…that outcomes related to school resource differences are more positive in the poorer countries or in countries that begin with lower levels of resources" (p. 497). Regardless of national levels of wealth, family factors are found to be more important predictors of educational achievement than are school factors in most countries. Hanushek's meta-analysis (1997) of over 4000 studies shows that the evidence on school resources is inconclusive—there is not a strong or consistent relationship between student performance and school resources after variations in family inputs are taken into account.

Notwithstanding debates around whether school resources matter less than family background for student achievement, the analysis of levels of school resources remains relevant to this study because it provides the baseline from which to study of the inequality in the distribution of the resources. Researchers have noted that it is not sufficient to examine overall levels of school resources without taking into consideration the distribution of these resources, as

inequality may influence the relationship between the level of development of a country and the impact that schools have on achievement (Chudgar & Luschei 2009). This current study is not concerned with determining whether family background or school resources matter more for Arab student achievement. Rather, I examine the availability and distribution of school resources as an indicator of the relative quality of schools in the Arab region and of the learning opportunities available in schools to students in the region.

School resources are usually categorized into three groups, consisting of material, human, and curricular resources. Material, or physical, resources can include a range of things: from pencils and paper, to textbooks, to computers, instructional materials, budgets, and school buildings and grounds. Human resources include teacher characteristics, such as experience, education, and field of study. Curricular resources include the intended learning objectives and the time spent in instruction, also known as the opportunity to learn. A detailed discussion of the importance of each resource follows.

A. Material Resources

Studies have shown that the availability of material resources such as textbooks are important for schooling (Heyneman et al., 1981; Heyneman and Loxley, 1983; Jamison et al. 1981), but that their benefits depend on teachers' ability to use them effectively (Glewwe 2002). Textbooks, when used effectively, serve as a vehicle for students to review material, read new material, and practice concepts independently. Beyond textbooks, computers in classrooms and schools have become a common feature. Fuchs and Woessman (2004) use PISA data to explore the effect of the availability and use of computers at school and find "disappointing results" in

terms of effects on students' educational performance. Yet, despite the lack of direct link between computers and achievement, a school without computers is considered anachronistic. As schools in developing countries try to modernize, one of the most visible ways is to equip schools with computers. Class size is another important material resource, as it relates to both the physical space for a classroom and the financial resources available to a school. Smaller classes are generally thought to be better for student achievement (for example, Lee and Zuze, 2011), and evidence from a widely-cited experimental longitudinal study shows the effect of smaller class size is strongest for the earliest years in school and for minority and low achieving youth (Word et al., 1990). But internationally, a study by Pong and Pallas (2001) using TIMSS 1995 data for developed countries (US, Canada, Australia, France, Germany, Iceland, Singapore, Korea, Hong Kong) reveals that math achievement is higher in countries with larger class sizes, which are more likely to be found in centralized school systems than they are in decentralized systems. Cross-national studies on the importance of material resources in schools has seldom included a close examination of the Arab region; as such, the present study will attempt to fill this gap.

B. Human Resources

Much school effectiveness research has focused on teachers as the most important human resource in schools, as high quality teachers are critical to student achievement (Greenwald, Hedges, and Laine 1996; Krueger 2002; Hanushek 1997). Teacher quality is multifaceted, and literature on which teacher characteristics matter most for student achievement and the extent to which they matter has not reached a consensus, partly due to the difficulty in isolating observable teacher characteristics from other factors that affect achievement.

More experienced teachers are assumed to have more knowledge and better skills as a function of the time spent teaching. Rice (2003) offers a review of empirical studies that have examine teacher experience as a key treatment. One clear aspect emerges from her and other reviews—specifically, that the relationship between teacher experience and student achievement is not linear. Teachers' effectiveness in improving student achievement appears to increase most in their first three years, but shows no major improvement after that (Rivkin, Hanushek, Kain 2005). While Rice disagrees with Rivkin et al. on a number of measures, this is one point where interpretations converge. Nonlinear models are more likely to capture an effect for teacher experience. The relationship is most evident in the first several years of teaching, with some evidence of "vintage effects" for very experienced teachers, or those with 15 or more years of teaching experience. Others have argued that "vintage effects" reflect difference in the average abilities of teachers who entered the profession at various points in time (Rice, 2003, 19).

Teacher preparation has also been identified as an important resource, although findings are mixed on the influence of teachers' formal education, post-secondary training, and in-service training on achievement (for a review, see Fuller and Clarke, 1994). The years and type of schooling a teacher undergoes is thought to influence student outcomes. Specifically, teacher education comprises two characteristics: 1) the highest level of education attained[2] and 2) the content of teacher education. The assumption is that higher levels of education impart greater pedagogical understanding of subject matter and theoretical understanding of how students learn a particular subject. Teacher education programs are assumed to prepare teachers to apply their subject matter knowledge to classroom instruction. However, research on the relationship between teacher education programs and teacher performance on the job is limited (Cochran-

Smith 2005). The research in this area tends to show that teachers learn professional knowledge and skills from these programs, but provides little evidence about the degree to which the learned skills contribute to teacher effectiveness (Wayne & Youngs, 2003).

One example of the type of debates that characterize teacher effective research involves the effect of advanced degrees of teachers on student achievement. While most studies of the impact of a teacher's advanced degree on effectiveness have often found no positive effects on student achievement, some studies that take into consideration the subject area of the degree and teaching assignment have found a positive effect of subject specific advanced degrees on student achievement (Rice, 2003). Subject-specific teacher preparation and in-field teaching has been shown to be important for mathematics achievement, while results for other subjects have been mixed and indeterminate (Wayne & Youngs, 2003). Coursework in both pedagogy and content has a positive impact on student achievement, and the effect of pedagogical coursework is strong (Wayne & Youngs, 2003). Positive associations between teacher coursework and degrees and achievement have been found for high school math. For example, Goldhaber and Brewer (2000) highlight the importance of the subject area in which the degree was awarded for positive teacher effects. They found that high school student achievement gains in mathematics were associated with students assigned to teachers who earned a master's degree in mathematics (compared to teachers who had either no advanced degrees or advanced degrees in non-mathematics subjects). Additionally, teachers holding both a bachelor's and a master's degree in the subject area taught were most effective. On the other hand, Rivkin et al. (2005) maintain that there is no evidence that a master's degree improves teacher skills.

A study on teacher quality in 46 countries (Akiba, LeTendre, and Scribner, 2007) analyzed teacher certification, subject matter knowledge, pedagogical knowledge, and teaching

experience and found that countries with better teacher quality had higher mathematics achievement[3]. They use measurable characteristics of teacher quality that have been linked with student achievement and share relatively common meaning across cultural contexts: certification, mathematics major, mathematics education major and teaching experience. No published study examines these characteristics for teachers in the Arab countries. For this study, I rely on these measures as indicators of human resources.

C. Curricular Resources

In addition to physical resources and teachers, instructional time is another input that is critical to student learning opportunities (Baker et al., 2004). Abadzi (2009) points to neuroscientific research that shows why learners need prolonged and repeated exposure to stimuli along with feedback for error correction. The idea of opportunity to learn (OTL), introduced by Soresson and Hallinan (1977) shifted the discussions of school resources towards understanding the mechanisms with which they are used to promote learning. Research has found that curriculum exposure is a strong predictor of test scores, and correlations between content exposure and learning are typically higher than correlations between specific teacher behaviors and learning (Wang 1998). Empirically, OTL became a measure of whether or not students have had an opportunity to study a particular topic or learn how to solve a particular type of problems presented by the test. OTL was and continues to be measured by teachers' responses to questions on whether the content needed to respond to items on the achievement tests had been taught to their students. OTL was a way of comparing the intended curriculum described by officials at the national level to the implemented curriculum interpreted by teachers

[3] Akiba, LeTendre, and Scribner (2007) also found that larger opportunity gaps in access to qualified teachers did not predict larger achievement gaps between high-SES and low-SES students cross nationally.

in individual classrooms (McDonnell, 1995). Even though instructional time is interwoven with the quality, timing, and content of instruction, it is nevertheless a central component of school resources.

International studies that have examined the relationship between time and achievement include Baker et al. (2004), who use TIMSS and other data from international studies to find no significant relationship at the cross-national level, between achievement and the amount of instructional time. They suggest that "differences in achievement as a function of instructional time will only emerge from comparing extremely low amounts of time with some threshold amount, and then a diminishing return will be seen beyond that point"(Baker et al., 2004, 331). Research has also found that the relationship between time and achievement displays diminishing marginal effects (Baker et al., 2004; Bellei,2009). Corroborating the idea that there is a world norm in instructional time, Benavot (2004) presents evidence to suggest that global homogeneity in the structuring of mathematics education has increased (Benavot 2004) between 1980 and 2000.

While interest in the issue of instructional time in developed countries has waned since the 1990s, internationally, it has been has been identified as a major barrier to learning, as actual hours of instruction have differed from officially reported hours of instruction. Reasons for the discrepancy include time being diverted to administrative and non-teaching activities, teacher tardiness, absenteeism and early departure, semi-official holidays, and teacher strikes (Millot and Lane 2002; Abadzi 2009). In a recent study, Abadzi (2009) shows that students in developing countries are often taught for only a fraction of the intended number of school hours, as time is often wasted due to informal school closures, teacher absenteeism, delays, early departures, and poor use of classroom time. Instructional time is especially important for poor and low-achieving

students, whose out-of-school time and opportunities for learning at home are limited (Millot and Lane 2002; Bellei, 2009).

Few studies have looked at instructional time in the Arab region. Millot and Lane (2002) use questionnaires to collect official data in Egypt, Lebanon, Morocco, Tunisia, and Yemen, and find that the impression of a relative regional homogeneity which produces the analysis of global time amounts disappears with a more detailed study of the way these amounts are spent. For example, although teachers in Lebanon are officially expected to work 23-25 hours a week, most teachers work fewer hours than this. Another study shows that the Arab States, along with other world regions, expanded their time annual instructional time in the years between 1980-2000 (Benavot 2004). In this study, I examine average levels of instructional time and content coverage, and the inequality in the distribution of these resources, an aspect that has been absent from previous literature.

2.2. Educational Inequality: theoretical foundations and empirical variation

Sociologically, competing theories explain educational inequality in attainment. Functionalist theories suggest that the educational system expands in response to the functional requirements of an industrial society and that education plays an increasingly important role in the process of status attainment (Treiman 1970). Educational stratification is functional because it serves to differentiate and prepare individuals who have different abilities for the performance of occupational roles. Schooling is a meritocratic mechanism for allocating individuals to occupations, allowing for the upward social mobility of capable, motivated children of parents with lower socioeconomic status groups. As the level of educational requirements in industrial

societies rises, educational qualifications become more important for occupational placement. With increasing modernization and expansion of the educational system, educational selection tends to become more meritocratic. Functionalists predict that inequality of educational opportunity, as measured by its dependence on socioeconomic and other socio-cultural characteristics, should decrease across all educational levels over time.

On the other hand, cultural reproduction theorists (Collins 1971) claim that educational certificates serve to exclude members of subordinate and low status groups from desirable positions in the occupational structure. Education-based selection and allocation in the labor market are used to maintain the hegemony and privilege of the dominant social groups (Bowles and Gintis 1976, Bourdieu 1973, Collins 1971). According to this group, educational credentials mirror the class structure and help legitimize inequality of job opportunity. Existing social inequalities primarily serve the interests of elites, and these inequalities are reproduced through schooling. The content and process of schooling are biased in favor or against those with different amounts of economic capital and/or those with different forms of cultural capital.

Both approaches find that educational expansion leads to greater equality of educational opportunities at the lower levels of the educational system over time. However, they disagree as to the predicted trends in inequality of higher education at the higher levels of the educational hierarchy: modernization theorists predict a decreasing trend of inequality of education over time; and conflict theorists expect an unchanged or even an increasing importance of social origin (Shavit & Blossfeld 1993).

Baker & LeTendre (2005) explain the origin of educational inequality as a result of two institutional characteristics: 1) meritocratic opportunities to learn and 2) the increased social and economic relevance of school performance and credentials for adult status and well-being.

School systems and families, they argue, respond differently to these characteristics. The school places emphasis on meritocracy based on cognitive ability, while the family is driven to create the maximum amount of educational opportunity. Some nations buffer from social inequalities more than others. Baker & LeTendre find that poorer nations tend to produce greater inequality than in wealthier nations, a situation which poses a challenge to economic and social development.

Studies of educational inequality are diverse in their conceptualizations and measurements of inequality. Educational inequality is a broad concept that can refer to inequalities in school finance, school enrollments, school expenditure, educational attainment, and opportunities. A review of the research reveals a lack of cohesion in the treatment of educational inequality, within and among sociological and economic discussions.

From the sociological perspective, inequality is often discussed in the context of education and stratification. Research in this area focuses on the relationship between family factors—parental education, income, occupation—and educational outcomes—achievement, attainment, retention. Buchmann and Hannum (2001) provide a thorough review of the research in this field for developing countries, highlighting the range of relationships and factors that have been studied.

In the economics literature, education inequality refers to multiple concepts, reflecting a lack of consensus and ambiguity around the best way to operationalize and measure inequality. Dependent variables have included enrollments, attainment, spending, and achievement; analyses have used variance and standard deviation of schooling attainment (Londono 1990, Lam & Levinson 1991, Thomas, Wang, & Fan 2003). There is much debate on the use of these methods, for example, Thomas and Wang (2008) argue that the use of standard deviation of schooling

attainment is not a rigorous measure of inequality. Instead, they estimate Gini coefficients, typically used to measure distributions of income and land, for school attainment data. Holsinger (2005, 2008) has been a strong proponent of the study for educational inequality, using Gini coefficients for education. Chiu and Khoo (2005) calculate a measure called "privileged student bias" to determine the extent of inequality in achievement.

The idea of inequality of opportunity has its origin in the liberal goal that a person's chances to get ahead—attain an education and get a good job—should be unrelated to ascribed characteristics such as race, sex, or socioeconomic origin (Breen & Johnson 2005). In their review of research on educational inequality, they focus on the link between social origins and educational attainment in mostly European countries. They observe that neither the modernization hypothesis (which predicts that origin effects will generally decrease with educational expansion) nor the reproduction hypothesis (which predicts that inequalities will decrease then increase in later transitions) is supported by evidence. The prevailing pattern was stability in origin effects on educational transitions—with the exception of Sweden and Norway, where equalization was found to have occurred. Most recently, de Barros, Ferriera, Vega, and Chanduvi (2009) study the inequality of opportunity in educational achievement in Latin America using PISA data, noting because of the heterogeneity of school quality, educational achievement is likely to be a better measure of human capital than educational attainment. Using decomposition techniques[4], they found that inequality of opportunity accounted for 14-28 percent of overall inequality in reading achievement and 15-29 percent in math achievement. The circumstances that had the largest impact on opportunity shares were family background

[4] Total inequality in achievement was decomposed into the share accounted for by family background variables and the share accounted for by effort, skill, or luck.

variables, mother's education and father's occupation. Their compilation of characteristics of the most educationally-disadvantaged groups reveal that those groups tend to include a disproportionate share of children of agricultural workers and parents with little or no schooling.

Using a different approach to inequality of opportunity, Akiba, LeTendre, and Scribner (2007) analyze 'opportunity gap' as differences in access to qualified teachers. Using correlation and multiple regression analysis, they examine the relationship between national levels of teacher quality and SES based-achievement gaps in access to qualified teachers and national achievement outcomes. They found that the opportunity gap, measured by the difference in the percentages of high-SES and low-SES students taught by teachers with mathematics major was significantly and positive associated with the achievement gap. Willms (2006) proposes another approach to analyzing educational inequality within a country using that regress achievement scores on family and school socioeconomic status. He suggests that socioeconomic gradients serve as starting points for a more thorough analysis of the relationships between schooling outcomes and the inputs and processes that affect these outcomes.

Educational quality, inequality, and economic growth

Several ideas can be used to explain the relationships between educational quality, inequality, and economic growth—which, while there are other valuable outcomes, is commonly utilized. Typically, studies have used years of schooling (or attainment) and enrollment as measures of educational quality to predict economic growth. Using attainment or enrollment as the independent variable has been criticized for its failure to take into account school quality—with cognitive outcomes as the independent variable predicting growth (Hanushek and Wößmann 2007). Hanushek critiques studies that use years of schooling—educational attainment—as the independent variable when predicting economic growth. He

argues that the use of years of schooling as a measure of education is flawed because "one year of schooling does not create the same amount of acquired knowledge regardless of the quality of the education system in which it takes place, but delivers different increases in skills depending on the efficiency of the education system, the quality of teaching, the educational infrastructure, or the curriculum" (Hanushek and Wößmann 2007). The emergence of international tests has allowed researchers to use results (which can be said to measure cognitive skills) as a proxy for the quality of education. This in itself is a new idea of educational quality, which has typically been measured by inputs, not outcomes.

When using the data from the international student achievement tests to build a measure of educational quality, Hanushek and Kimko (2000) find a statistically and economically significant positive effect of the quality of education on economic growth in 1960-1990 that dwarfs the association between *quantity* of education and growth. Ignoring quality differences misses the true importance of education for economic growth. The Arab countries may fall into this category—increased quantity of education, poor quality, and low growth.

The distribution of opportunities has been identified by de Barros et al. (2009) as key to development, and Birdsall and Londono (1997) also found a significant negative correlation between education *dispersion* and income growth. Birdsall, Pinckney, and Sabot (2001) present a growth model of a virtuous circle in which encouraging the poor to invest in human capital generates higher productivity and lower inequality in the future. Benefits accrue when reduced inequality results from expanded education and increasing returns to assets held by the poor—this results in human capital accumulation with equitable growth. Birdsall et al. find that resource abundance—a feature of several Arab countries—tempts governments to move away from the policies that generate this virtuous circle. Resource rents become concentrated in the

hands of the government or a small number, which leads to high equality. The government tries to assuage the poor by directing some proportion of resource rents to populist programs, including the expansion of education. Birdsall et al. hypothesize that schooling in this environment is more of a consumption good than an investment good, so that the quality of education is likely to suffer. Moreover, they argue that the labor market in a capital-intensive economy offers little benefit for moderate levels of education. The likely result is little investment and dynamism outside of the natural resource sector along with high inequality, poor quality schools, and little demand for education.

As an explanation for why growth has not increased at the rate of education, Pritchett (2001) finds that while educational attainment has expanded rapidly, education contributed much less to growth than would have been expected since the 1960s. He offers three explanations: 1) schooling has created cognitive skills, but the institutional environments have been sufficiently bad that the bulk of skills have been devoted to privately remunerative but socially wasteful or counterproductive (rent seeking) activities. 2) Rates of growth of demand for educated labor influence the rates of return 3) the range in quality of schooling means that some school systems are effective in transmitting knowledge and skills, but others are not.

While recognizing that economic growth does not necessarily trickle down and lead to 'development', growth is one accessible economic indicator of the productivity of a nation. As such, the slow growth in Arab countries is symptomatic of the larger trend of low productivity.

2.3 Inequality in the Arab region

Few studies on educational inequality in the Arab world have been published to date. In the absence of research on educational inequality, I look to studies of general inequality to inform educational inequality. However, even the existing evidence base for income inequality on the region is challenged, and the true picture is murky. In general, attempts to determine the extent of income inequality in the countries of the Middle East have been limited by the lack of available data. In the cases where data are available, the results are mixed. The following section describes the main findings of the most relevant studies on inequality in general and educational inequality in specific, highlighting the knowledge gaps that motivate my study.

Past research has shown a low incidence of poverty in the Middle East—for example, Adams and Page (2003), World Bank economists, use aggregate cross-sectional data for five countries in the Middle East and North Africa to show that there is an unusually low rate of poverty. According to their estimates, only 2percent of the people in the countries selected live below $1 a day, the international poverty standard. They also show that in the countries studied, income distribution has become one of the most equal with an increasing share of income going to the poorest quintile of the population. However, a caveat about Adams and Page's conclusions is that they use a limited sample of countries—Egypt, Jordan, Morocco, Tunisia, and Iran[5]--to make generalizations about the entire region, despite finding considerable variation among those five countries. The authors attribute the low incidence of poverty to the redistribution of oil rents through labor remittances[6] and government jobs. They explain that

[5] They limit their analyses to the countries which have conducted nationally representative household budget surveys, and only two of which are accessible to the public.

[6] Jordan and Egypt have experienced a boom and bust cycle deriving from volatility in the price of oil and changing migratory opportunities in the Persian Gulf (Adams and Page 2003), while Morocco and Tunisia, whose workers migrate to Western Europe, were relatively unaffected by oil price changes.

because low-inequality countries are more effective at reducing poverty than high equality countries, the region can have low poverty despite low rates of growth.

The rosy picture painted by Adams and Page is refuted by Chaudhry (2005), Bibi & Nabli (2010), and El-Ghonemy (1998). In reaction to the observation that the Middle East and North Africa (MENA) has relatively low levels of poverty and inequality, Chaudhry (2005) questions what it means to "juxtapose a region that has had access to about roughly 20,046 billion dollars of oil revenues between 1974 and 1996 and 784 billion dollars of aid from 1970 to 2003 with countries characterized by enduring and dramatic capital scarcities?" (Chaudhry 2005, 2). In her view, it is no accomplishment that the MENA region, which had access to the largest capital inflows in the history of the developing world, and very low population densities, compares favorably with countries like Bangladesh. Her analysis, while citing the "appalling quality" of economic data[7]--which fail to take into account the large informal sector in the region –argues that aggregate measures mask the reality of economic insecurity caused by oil price-related boom and bust cycles. She describes three basic structural imbalances that pose long term challenges to the region, and cause her to "question the basis for celebrating the Arab world's affluence and higher levels of equality relative to other least developing countries." First, the region's growing water scarcity and heavy reliance on food imports is a threat to and cause for instability. Second, the high population growth rate combined with and a poorly educated and ill-prepared labor force poses a threat to a stable environment. Third, the region's wars[8] and economic volatility reshape economic fortunes in the region across countries in ways

[7] Chaudhry argues that the lack of data is not accidental: "where corrupt and unpopular governments are deemed to be important allies, a unity of interest emerges in secrecy". National elites created a virtual void of economic and social information, and most studies published by economists affiliated with the World Bank focus on "selected" countries that permit them to deploy of an image of economic health.

[8] There has been at least one major war in the region since the 1970s, not counting the Palestinian-Israeli conflict.

that are unanticipated and sudden, contributing to the instability. According to the author, these three factors have given rise to a set of inequalities not captured by conventional economic measures. New forms of poverty and inequality will continue to be divisive and socially disorienting, for example, the feminization of labor in patriarchal societies where male unemployment is high and growing, sub-national differences in economic performance, and the progressive retreat of the state from the provision of social services (Chaudhry 2005).

Like Chaudhry, Bibi and Nabli (2010) question the utility and accuracy of existing analyses based on limited data. They note that micro-level and household data are collected inconsistently and often inaccessible when they are collected. In their comprehensive review, they find that research on inequality in the Arab world tends to be partial and based on individual efforts, focusing on a very limited set of countries. Using the limited data available, Bibi and Nabli (2010) find the pan Arab Gini indices are around 38 percent, which do not show a very high inequality level, and are relatively stable. However, only six countries are usually considered: Algeria, Egypt, Jordan, Morocco, Tunisia, Yemen, and Iran. They question the comparability of regional Gini coefficients is because Middle East and North African calculations are based on expenditures, while Latin America coefficients (which are higher) are based on income. For Jordan, the country where both income and expenditure based Gini are available, the difference is 35percent for expenditure and 40 for income. If the expenditure based Gini is adjusted by 5 percent for all countries, the superiority of MENA in comparison to Latin America narrow.

El-Ghonemy's (1998) analysis focuses mainly on public expenditures and private consumption, reveals some alarming regional and sub-regional trends. In his comparison of military expenditures to educational expenditures, El-Ghonemy (1998) criticizes governments'

allocation of resources to military purposes instead of "to human security against illness, diseases, malnutrition, and illiteracy" (95). Military spending in Saudi Arabia, for example, was about $200, 000 per person—nearly 12 times the public spending on education per person. Between 1960 and 1980, Syria spent 37 percent of total public expenditure on defense; Oman, Saudi Arabia, and the United Arab Emirates spent nearly half of total expenditures on military purposes. Richards & Waterbury (1996) also discuss the high level of conflict afflicting the region: "the Middle East has had more than its share of military violence…and has devoted more of its human and material resources to defense and warfare than many other regions of the developing world"(330). El-Ghonemy (1998) notes that despite this military expenditure, the oil-rich Arab countries still needed foreign forces to save them from the consequences of the Iraqi invasion of Kuwait.

In addition to public expenditure, inequalities are also seen in private consumption, especially in cars and food. El-Ghonemy finds that affluence is positively correlated with obesity and diabetes in the rich Gulf countries (Saudi Arabia, Kuwait, and Bahrain). Overconsumption in this group co-exists with anemia and malnutrition among children. There has been a shift toward consumption of traditional items by low-income groups and the poor towards modern high-income products, fueled by aggressive advertising of consumer products the poor cannot afford. In line with this view of overconsumption, a former Arab finance minister has said, "The Arab world, in its oil and other centers, has yet to modernize itself in line with the requirements of globalization. Building skyscrapers and state-of-the-art airports and owning luxury cars are the external shell of economic modernity, not its beating heart, which lies in science, knowledge, and technological innovation" (in UNDP 2003).

The following section summarizes the main findings of some individual country case studies on educational inequality. A Yemeni study (in Bibi & Nabli, 2010) shows that the distribution of public spending on education across household deciles favors the poorest households, but similar to the pattern in other developing countries, public spending on basic education favors the poor, but spending on universities and vocational training is heavily tilted toward the rich. As poor households tend to have more school-aged children, using individuals as opposed to households as the unit of measure showed that education subsidies across individual deciles are less equalizing. A 1997 Egyptian household survey revealed that the distribution of years of schooling is biased against the poor, women, and rural people. The opportunity cost, and not access to schools, is the obstacle.

In a country study on poverty, growth, and income distribution in Lebanon, Laithy, Abu-Ismail, and Hamdan (2008) find that poverty correlates with school participation, and that there is a lower likelihood of school enrollment, attendance, and retention for poor children. The gaps between poor and non-poor in enrollment rates widen from elementary to intermediate to secondary education. Only one poor child out of two is enrolled in intermediate schools, and only one poor child out of four is enrolled in secondary schools[9]. The persistence of inequities in educational attainment at the intermediate and higher levels highlights the need for more effective public intervention to improve educational outcomes for poor students. Among the poor in Lebanon, one third of extremely poor university graduates are unemployed, compared to only one out of five non-poor university graduates. This implies that the poor are deprived from access to job opportunities commensurate with his higher education level. Households headed by individuals who have less than elementary education constitute 45 percent

[9] Compared with 3 out of 4 for intermediate and one out of two for secondary education among the non-poor.

of all the poor. Laithy et al. (2008) also find that poverty rates in the rural North of the country are much higher than in urban areas, suggesting some degree of spatial inequality.

Tansel & Kazemi (2000) examine inequality in government expenditures among different education levels—primary, secondary, tertiary—and find that spending on tertiary education is disproportionate to the percentage enrolled in tertiary education compared to secondary and primary. Heyneman (1997), while pointing to the unfavorable economic performance of the MENA region compared with most regional competitors, identified inequality in education financing as one part of the problem, showing that some countries the Middle East spent 14 or 15 times more on higher education students than on students in basic or compulsory education, compared to twice as much in OECD countries. Another source of inequality is in female-male enrollment, with female enrollment in tertiary education higher than that of males in Bahrain, Jordan, Kuwait, Lebanon, Qatar and Saudi Arabia (UNDP 2003). Using data from TIMSS 1994, Wiseman and Alromi (2003) measure educational inequality by the coefficient of variation and find that Iran and Kuwait rank within the top ten most unequal nations on instructional resource inequality, teacher experience, and student-teacher ratio. A recent World Bank report (2008) shows that the distribution of human capital has become worse over time in MENA when education inequality is measured by the standard deviation of the years of schooling. Starting from a relatively equal distribution in the 1960s and 70s, the standard deviation of the mean years of schooling is now higher in the region than it is in East Asia or Latin America. This is attributed to the allocation of public expenditures towards higher education, and the increasing reliance on the private sector. The report notes that privatization of the education sector has been pursued without a clear strategy as to the level of education left to the private sector or as to how poor student may access private schools.

Generally, the Arab region is credited with expanding educational access rapidly and ensuring that girls and boys have access to primary and secondary schools. Health care has also improved dramatically. However, inequalities remain in other areas. There are vast urban-rural divides. Most rural areas in the Arab regions are neglected. Infrastructure and public facilities are of a much lower quality than can be found in urban centers. Recent studies have been showing that Arab women are becoming more educated than men, often outperforming males academically and displaying higher rates of tertiary enrollment, but their participation in the workforce is minimal. In addition, in Saudi Arabia, they are intentionally excluded from fields in science and engineering, where the single-sex universities do not all offer similar majors. Women are confined to social services type jobs, and are not often found in entrepreneurial or management roles (UNDP 2003). The presence of these inequalities in school resource is part of the focus of the remainder of the study.

Chapter 3

Design, Data, and Methods

3.1 Design of the Study

This comparative study is designed to answer questions about the availability and distribution of different types of educational resources across the Arab region and within Arab countries. The availability of educational resources is one indication of school quality, and the distribution of these resources provides some evidence of the degree of educational equity between students. First, I make *international comparisons* by comparing average levels of educational resources in the Arab countries to two other country groups that serve as reference points to understand how the levels and distribution of resources in the Middle East compare globally. I also compare the relative dispersion of these resources across the country groups. Then, I focus in on the Arab region and make *intra-regional comparisons* between the oil-rich Gulf and the less rich Mashrek countries. Finally, at the micro level, I examine educational resource distribution across different types of student groups *within countries* in the region, based on gender, SES, and school sector. Figure 3.1 depicts these comparisons visually.

At the international level, given that the Arab countries (hereafter ACs) as a group fall at the bottom of the achievement rankings, it is likely that students there attend schools with lower levels of educational resources when compared with the better ranked OECD countries. Previous discussions of educational inequality in the Middle East and North Africa region indicate that,

Figure 3.1 Research design for comparison of school resource disparities

when measured by the standard deviation of years of schooling, educational inequality has become worse over time (World Bank, 2008). Similarly, I expect that inequality measured by resource distribution in the Arab region will be wider than it is in the OECD countries. At the intra-regional level, the Arab countries are a heterogeneous group, and as such, I expect that resources indicators will differ within the region among two groups of countries, the oil-rich Gulf and the less rich Mashrek. Characteristics that suggest that the oil-rich Gulf countries will exhibit higher and more equal levels of educational resources include their larger GDPs, smaller total populations, and strong redistributive policies at the national level. However, their low educational achievement suggests that Gulf countries may be undersupplying schools with necessary resources. The Mashrek countries, while not economically rich, have had longer experiences with formal schooling and tend to perform better overall, suggesting that educational resources may be higher there than in the Gulf region. Inequalities in resources are expected to be lower in the Gulf countries, again, because of their high GDP, smaller populations, and

redistributive mechanisms. The Mashrek countries are expected to have higher levels of inequalities because in most cases their populations are larger, with a higher proportion of people living in rural areas, and less stable governance.

Within countries, I explore whether girls are disadvantaged in terms of access to resources, and expect that resources will be evenly distributed, given the success story of girls' enrollment. I explore how students from high and low SES groups differ in their access to educational resources. Low-SES students are expected to have fewer resources that high-SES students, and this difference is likely to be larger in the Mashrek countries than in the Gulf. In terms of school sector, public schools students' access to resources should match that of private school students in the Gulf countries based on those nations extreme wealth, but in the Mashrek countries, I expect larger differences in access to resources between public and private school students.

3.2 Data

I use eighth grade mathematics data from Trends in International Mathematics and Science Study (TIMSS) 2007, which is a large-scale international assessment conducted every four years in over 60 countries that measures student performance in math and science among fourth and eighth grade students. TIMSS collects data not only on educational outcomes, but also classroom and school level indicators of resources and teacher practices that past research has shown to be important for achievement. Because none of the Arab countries collect this kind of publicly available data on their own, the TIMSS data provide an especially unique insight into their educational systems. For example, in the Gulf countries, "collection of economic and demographic data has been constrained by several historical factors that have left legacies of great mistrust in data collection, as well as a poor infrastructure for implementing data collection

activities. Social cultural norms do not lend themselves to divulging private info" (Gonzalez, 2008, p. 258). The TIMSS data, therefore, offer a rare opportunity to examine educational issues of critical importance that would not be available elsewhere

To obtain nationally representative samples of eighth graders in each country, TIMSS employs a stratified sampling design, in which each participating country randomly samples schools to be tested, and one class is randomly chosen for each school, and all students within the randomly selected class are tested in both math and science. The basic TIMSS sample design has two stages: schools are sampled with probability proportional to size at the first stage, and one or more intact classes of students from the target grades are sampled at the second stage. This includes all students enrolled in the grade that represents eight years of formal schooling, counting from the first year of ISCED Level 1, provided that the mean age at the time of testing is at least 13.5 years. The data collection procedures used by TIMSS are designed to ensure comparability across countries. In addition to math and science achievement scores, TIMSS includes surveys for students, teachers, and principals.

Education resource variables are discussed below in detail. The achievement scores in TIMSS are standardized with a mean of 500 and a standard deviation of 100. TIMSS uses Item Response Theory scaling to summarize student achievement on the assessment. The TIMSS IRT scaling approach used multiple imputation methodology to obtain proficiency scores in math and science for all students. Because each imputed score is a prediction based on limited information, it includes a small amount of error. The TIMSS database provides five separate imputed scores for each scale. Each analysis is replicated five times, using a different plausible value each time, and the results combined into a single result that includes information on standard errors that incorporate both sampling error and imputation error (Foy & Olson, 2009, 3).

3.3 Sample

My sample includes ten Arab countries that participated in the TIMSS at the eighth grade. While thirteen Arab countries participated in TIMSS 2007 at the eighth grade, I restricted the analysis to ten countries: Bahrain, Egypt, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, and the Palestinian territories. I exclude the Arab North African countries (Algeria, Morocco, and Tunisia). The included countries are more tightly linked to each other, geographically, economically, and culturally than they are to the Arab North African countries. I divide the set of Arab countries into two distinct groups: 1) the Mashrek states, on the eastern board of the Mediterranean: Egypt, Jordan, Lebanon, the Palestinian territories, and Syria, and 2) the Gulf states, including Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. Other scholars have used these country categories in discussions of education in the Middle East (see Bashshur 2009). In addition to the Arab countries, I include other country groups to serve as comparative reference points.

Country Groups. To determine how the levels of school resources in Arab countries compared to the levels of school resources in other world regions, I created inter-regional and intra-regional country groups to facilitate analysis. To compare the educational resources in Arab countries to countries with better TIMSS performance, I selected all the OECD countries that participated in the TIMSS at the eighth grade. They are Australia, Czech Republic, England, Hungary, Israel, Italy, Japan, Korea, Norway Slovenia, Sweden, Turkey, and the United States. In the analyses, data from these countries were merged and these countries were treated as one group, labeled "OECD." The OECD group has previously been used as a benchmark against which to compare Arab countries' performance on economic and educational indicators (Millot and Lane, 2002; Hanouz and Khatib, 2010). I selected another group of countries that were middle to low income as defined by the World Bank to serve as another counter point of

comparison. These were countries whose performance on the TIMSS was ranked in the bottom half, and this group includes Botswana, Colombia, El Salvador, Georgia, Ghana, Indonesia, Thailand, and Tunisia. Data from these countries were merged and they were treated as one group, labeled "Other". To observe regional differences within the Arab region, countries were grouped into oil-rich countries, referred to and labeled as the "Gulf" countries. They are Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman. The remainder of the Arab countries—Syria, Lebanon, Jordan, Egypt, and Palestine—are grouped. I refer to and label them as "Mashrek". To analyze within –country differences, I use the total sample of eighth grade students in each country. Table 3.1 provides sample and population sizes of schools and students in each country.

3.4 Variables

Educational Resource Variables. Based on school resource literature and of preliminary analysis of the data available in TIMSS 2007, I use three main groups of variables to measure the level and distribution of school resources available in the Arab countries: material resources, human resources, and curricular resources. Previous studies have used similar groups of resources to measure school quality (Adrogue 2011). Material resources included tangible materials used for instruction, such as textbooks, calculators, computer hardware, and software. Human resources comprised teacher characteristics that have been linked to student outcomes, such as years of teaching experience, education level, certification, and participation in professional development. Curricular resources included instructional time and the proportion of students taught the topics tested on the TIMSS. While educational resources can include more than those listed below, the selected variables capture some of what is determined in the literature to affect educational quality and outcomes. Compared to other unobserved variables

that may influence outcomes, this set of resource variables can be manipulated by policy changes at the national level.

Material Resources. There are six main variables that fall under the material resources category. I used the school principals' responses to school background questionnaire to create or obtain most of the material resource variables. The only exception is the *class size* variable, which is obtained from a question on the teacher survey that asks how many students are in the TIMSS class.

Instructional resources is an index variable from the principal survey that measures the extent to which a school's capacity to provide instruction is affected by shortages or inadequacies in the following areas: 1) instructional materials (textbooks), 2) calculators, 3) library materials relevant to mathematics instruction, 4) audio-visual resources for mathematics instruction, 5) computers for mathematics instruction, and 6) computer software for mathematics instruction. The original answer choices were 1) none, 2) a little, 3) some, and 4) a lot. The responses were recoded (so that a higher score indicates greater availability of the resource) and summed. *Educational infrastructure* refers to the quality of the school's physical structure and is also created from the principal survey on the school's background. The infrastructure variable measures the extent to which the school's capacity to provide instruction is affected by shortages or inadequacies in the following areas 1) school buildings and grounds, 2) heating/cooling and lighting, 3) instructional space (classrooms). Answer choices were 1) none, 2) a little, 3) some, and 4) a lot and were also recoded and summed. *Budget for supplies* measures the extent to which the school's capacity to provide instruction is affected by a shortage or inadequacy of the budget for supplies such as paper and pencils. *Class size* is the number of students in each TIMSS class and comes directly from the student survey. *Computers* measures the number of

computers available for educational purposes and is obtained from the principal survey on the school background. *Computers per student* is a ratio of computers to total school enrollment and provides a more refined indicator of the availability of this resource.

Human Resources. The set of human resource variables I use measure teacher characteristics that are associated with student achievement, such as education, experience, certification, professional development, and in-field teaching.

Teacher experience measures years the teacher has been teaching. *Teacher education* measures the highest level of formal education attained. Answer choices were 1) incomplete upper secondary, 2) completed upper secondary, 3) completed post-secondary non-tertiary, 4) completed tertiary (practical/technical/occupation specific), 5) completed theoretically based/research preparatory tertiary, 6) tertiary second degree (such as a Master's degree). *Teacher professional development* is a variable I created that measures the proportion of students taught by teachers who have participated in some type of professional development within the previous two years. Teachers responded to questions about whether they participated in certain types of professional development, such as content, pedagogy/instruction, assessment, curriculum, integrating, and critical thinking/problem solving. Based on these responses, the proportion of students who had a teacher participating in at least one professional development workshop was calculated. *Percent math major* indicates the proportion of students taught by teachers who majored in math. *Percent math education major* indicates the proportion of students taught by teachers who majored in math education. *Teacher certification* indicates the proportion of students taught by teachers who have a teaching license or certificate.

Curricular resources. The curricular resources include variables that measure instructional time and content coverage. These variables are derived by TIMSS from the teacher

and school surveys. *Weekly instructional time* is obtained from the math teacher survey and measures the minutes per week the teacher spends teaching math to the tested class. *Yearly instructional time* measures the yearly hours of implemented instructional time for math. *Proportion of time on math* measures the time spent on math instruction relative to total instructional time. *Proportion of students taught TIMSS topics* is a variable derived from teacher responses to whether they taught certain number, algebra, geometry, and data and chance topics that academic year or before that academic year. Following this, the average across the percentages of students taught all mathematics topics mostly before that year or that year was computed.

Student and School Characteristics.

SES. To capture the relative social position of individual students in the social structure, I created a standardized variable using a composite index that includes parental education, number of books at home, and an asset index of home possessions (Byun & Kim 2010; Chudgar & Luschei, 2009). These data come from the student background survey. Parental education is a TIMSS derived variable that used both mother's and father's education. The survey asked students about the highest level of education completed by each parent. Based on those responses, TIMSS created a variable that indicates the highest educational level of either parent. Responses to number of books at home included five choices which ranged from "none or very few (0-10 books)" to "enough to fill three or more bookcases (more than 200 books)". Home possessions data available in all countries include responses to whether or not the student has any of the following items in their home: 1) calculator 2) computer 3) study desk 4) dictionary 5) internet connection. The responses were summed into a home possessions variable.

School SES was measured by aggregating individual student SES for each school. This measure was cross-checked with two principal-reported variables, the proportion of economically disadvantaged students and the proportion of economically affluent students in the school.

Gender indicates the gender of the student. This variable comes from the student background survey. When used as a dummy variable, male is the reference group.

Sector indicates whether the school is public or private. When used as a dummy variable, private is the reference group. This was obtained from the stratification variables that certain countries chose to include in their data. Not all countries stratified according to school sector. In this study, I use four countries where school sector data are available: Lebanon, Bahrain, Jordan, and Palestine.

3.5 Methods

Between-Country Comparisons.

After creating the indicators of school resources, I calculated descriptive statistics for each country group (Arab, OECD, and Other), each Arab region (Gulf, Mashrek) and each individual Arab country; and a set of t-tests comparing means resource levels of Arab to OECD, Arab to Other, and Gulf to Mashrek were also calculated.

To obtain a measure of relative dispersion of resources, I calculated and reported the *coefficient of variation*, which is the standard deviation divided by the mean. The coefficient of variation (CV) is a simple and commonly used measure of relative dispersion in studies of inequality of educational attainment, resources, and education finance (for examples, see Zhang & Li, 2002; Iatarola & Stiefel, 2003; Adrogue, 2011; USDoE,1996; Wyckoff, 1992; Benavot 2004). The advantages of using CV is that it allows interpretation of the relative magnitude of

the standard deviation in relation to the mean and therefore allows comparison of the scatter of variables expressed in different units. The coefficient of variation eliminates the unit of measurement from the standard deviation of a series of numbers by dividing it by the mean of this series of numbers (Abdi, 2010; Bellu & Liberati, 2006). An absolute standard of 10 percent for the coefficient of variation is generally used to indicate equity, with values greater than 0.10 indicating some degree of inequity (Odden and Picus, 2000).

Within-country comparisons

To determine within-country differences, I conduct regression analyses to measure the extent to which gender, SES, and sector explain variation in achievement. I then created dummy variables for gender, SES (comparing the top third and the bottom third), and for school sector (where data were available). The statistical significance of coefficients was determined at the 0.05 level.

For the statistical analyses I use SPSS 20 in conjunction with software developed by TIMSS, the IEA International Database Analyzer. The software generates syntax that helps analyze achievement data by conducting each analysis separately on each plausible value, averaging the resulting statistics, and applying the jackknife algorithm to provide appropriate standard errors for each statistic. I applied appropriate sampling weights to all analyses (TOTWGT when analyzing student data linked to school background, MATWGT when analyzing student data linked to teacher background, and SENWGT when analyzing country groups). The sampling weights properly account for the sample design, take into account any stratification or disproportional sampling of subgroups, and include adjustments for nonresponse (Foy & Olson, 2009).

Because statistics generated from the international database are estimates of national performance based on samples of students, rather than the value that could be calculated if every student in every country had answered every question, TIMSS uses the jackknife procedure to quantify the uncertainty associated with these statistics. The jackknife procedure is used to provide a robust estimate of the sampling error of each statistic presented in the international reports. When used with achievement scores, the jackknife standard errors include both the error component due to sampling variation and the error component due to variation among the five plausible values generated for each student (Olson et al., 2009).

I exclude from the analysis any students that have missing data on any variables of interest. The proportions of missing data for each variable are provided in the Appendix. A high proportion of missing values for some variables in some countries can reduce the representativeness of the sample.

Level of Analysis

While it is possible to compute reasonable statistics with schools as units of analysis, the school samples were designed to optimize the student samples and the student-level estimates. Following other technical analyses of TIMSS which advise that it is preferable to analyze school-level variables as attributes of students rather than as elements in their own right, I use students, and not schools as the level of analysis (Foy & Olson, 2009).

3.6 Assessment of Representativeness of TIMSS Samples

Although the enrollment rates at the secondary level for the countries in the sample are high, a limitation of the dataset that may affect interpretation of results is that at the eighth grade level, the most disadvantaged students in many of these countries may have already dropped out of school. Because the results are restricted to students, and not all youth, the data may not

provide a complete picture of inequality of opportunity. Another limitation stems from the availability of data on the parents' occupational status and the weaknesses of the family structure data in the TIMSS survey (Buchmann, 2002). As a result, the SES measure is different than traditionally defined (income, education, and occupation), but represents the best available data for the Arab countries.

Table 3.1 Population and Sample Sizes- Eighth Grade.

Country	Population		Sample			Average Age at Time of Testing
	Schools	Students	Schools	Students	Est. Pop.	
Bahrain	74	11,667	74	4,230	11,370	14.1
Egypt	8,179	1,342,127	233	6,582	1,059,228	14.1
Jordan	1,691	108,856	200	5,251	110,338	14.0
Kuwait	163	23,827	158	4,091	23,926	14.4
Lebanon	1,574	63,755	136	3,786	59,668	14.4
Oman	722	56,569	146	4,752	50,834	14.3
Palestinian Nat'l Auth.	1,130	94,376	148	4,387	92,608	14.0
Qatar	67	7,332	66	7,184	7,429	13.9
Saudi Arabia	6,271	332,479	165	4,243	370,882	14.4
Syria	3,756	270,389	150	4,650	260,481	13.9

Source: TIMSS 2007 Technical Guide, p 164

Chapter 4

International, Intra-regional, and Cross-national Resource Differences

The debate on the relative importance of schooling inputs for educational achievement in developed and developing countries continues, with some research studies showing little effect and others showing the opposite. Notwithstanding the true relationship of school resources on achievement, identifying the pattern of levels of material, human, and curricular inputs available to principals and teachers across the Arab countries indicates the extent to which schools' needs are met. While recognizing that the availability or surplus of some of these resources neither ensures nor predicts student achievement, resources shortages—perceived or otherwise—are a symptom of a system struggling to meet its needs. The availability of resources can act a proxy for the extent to which schools' instructional needs are adequately met, and the distribution or spread of resources is an initial indicator of the inequality in the system.

This chapter presents two main sets of results. First, I compare education resource availability and distribution across regions, within the Arab region, and then at the country level. Second, I compare resource availability and distribution within countries, across students differentiated by gender, SES, and school sector. As an indicator of the comparative standing in educational outcomes of these selected Arab nations, I begin by briefly examining the achievement levels and distribution internationally, intra-regionally (within the Arab region), and at the country level. As an indicator of inequality, I use the coefficient of variation and, for achievement, a set of quantile ratios: the 90/10 ratio, which is decomposed into the 90/50 ratio

and the 50/10 ratio.[10] This analysis will show that in general, resource indicators are lower in the Arab region, and inequality is also higher.

To address the main research questions on educational resources, I next examine and compare educational resource availability and distribution in the Arab region at three levels: internationally, intra-regionally, and at the individual country level. Three sets of comparisons are made:

a) Students in Arab countries (ACs) versus students in OECD countries versus students in a group of other low-performing, middle- to low-income countries (Other).
b) Students in the oil-rich Arab countries (Gulf) and the other Arab countries (Mashrek)
c) Students in each Arab country

To examine the association among achievement, resource inequalities, and three salient social and education characteristics in these nations, I present within country differences in achievement and resources based across b) boys and girls, b) high and low SES, and a) public and private school students. T-tests are used to determine whether mean differences between these groups are statistically significant at the 0.05 level. These results indicate gender differences in resources are subtle, whereas SES and sector differences are more pronounced.

4.1 Achievement Differences

TIMSS scales achievement scores so that the mean is 500, and the standard deviation is 100. The benchmarks are 400 (low), 475 (intermediate), 550 (high), and 625 (advanced). At the macro level as shown in Table 4.1, the Arab region has a mean of 378.88, a standard deviation of

[10] This decomposition indicates the extent to which the 90/10 ratio is driven by inequality in the top of the distribution versus inequality at the bottom end (Hale, n.d).

98.26, and a coefficient of variation of 0.26. The 90/10 index shows that those at the 90th percentile score twice as high as those at the 10th percentile. The 90/50 and 50/10 indices show that the differences are larger at the low end of the achievement distribution in the Arab region. The Arab region exhibits the lowest mean achievement, not even reaching the low benchmark, and the highest levels of achievement inequality (when measured either by the coefficient of variation or by the 90/10 index) compared to the other country groups. Within the Arab region, the oil-rich Gulf countries do worse than the Mashrek countries, and the distribution of achievement in the oil-rich Gulf countries is slightly more unequal than in the Mashrek countries. At the country level, Lebanon has the highest achievement and lowest inequality, while Qatar has the lowest achievement and the highest inequality. Other countries where inequality is high are Palestine, Egypt, and Oman, where students at the 90th percentile performed twice as well than those in the 10th percentile. Other countries with lower levels of achievement inequality are Bahrain and Syria.

Table 4.1 Average levels and distribution of achievement across regions, within regions, and by country

	Mean of Math Achievement	Standard Deviation	Coefficient of Variation	90/10 index	90/50 index	50/10 index
International						
OECD	503.27	92.62	0.18	1.61	1.23	1.31
Arab	378.88	98.26	0.26	2.01	1.33	1.51
Other	382.59	93.11	0.24	1.89	1.31	1.45
Intra-regional						
Gulf	352.06	91.49	0.26	2.01	1.33	1.51
Mashrek	405.79	97.48	0.24	1.91	1.30	1.47
Country level						

Lebanon	449.06	74.64	0.17	1.55	1.23	1.26
Jordan	426.89	102.21	0.24	1.92	1.28	1.49
Bahrain	398.07	83.60	0.21	1.75	1.27	1.38
Syria	394.84	82.40	0.21	1.73	1.27	1.36
Egypt	390.56	100.25	0.26	2.02	1.33	1.52
Oman	372.43	94.94	0.25	2.01	1.30	1.54
Palestine	367.15	102.44	0.28	2.14	1.35	1.59
Kuwait	353.67	78.64	0.22	1.81	1.28	1.41
Saudi Arabia	329.34	76.43	0.23	1.86	1.30	1.43
Qatar	306.79	93.36	0.30	2.30	1.39	1.65

4.2 International differences in educational resources

Here, the three types of resources described in Chapter 2—material, human, and curricular—are analyzed at first the international level, then at the intra-regional level, and finally at the country level.

A. Material Resources. Material resources include six types instructional resources, educational infrastructure, budget for supplies, computers, computer per student, and class size. As shown in Table 4.2, a comparison of the means of instructional resources[11] reveals that on average, eighth graders in Arab countries attend schools with lower levels of instructional resources than schools in the OECD countries. Similar to the pattern for instructional resources, students in Arab countries attended schools with less adequate educational infrastructure and fewer computers than OECD countries. The ratio of computers to students is significantly lower for all Arab countries as compared to the OECD mean ratio. On average, there is one computer for every 20 students in the Arab countries, while in the OECD countries there is one computer for every 10 students. Class sizes are also significantly larger on average in the ACs. Compared to OECD classes, which have an average of 26 students, Arab class sizes are significantly larger with 32 students. Compared to the "Other" group, the Arab countries tend to do slightly better,

[11] *Instructional resources* is an index variable from the principal survey that measures the extent to which a school's capacity to provide instruction is affected by shortages or inadequacies in the following areas: 1) instructional materials (textbooks), 2) calculators, 3) library materials relevant to mathematics instruction, 4) audio-visual resources for mathematics instruction, 5) computers for mathematics instruction, and 6) computer software for mathematics instruction.

having more resources, better infrastructure, a more adequate budget for supplies, and smaller class sizes. Inequality in instructional resources, infrastructure, and computers per student is greater in the ACs than in the OECD countries. Compared to the other group of other low-middle income countries, however, the inequality in the ACs is lower.

Table 4.2 Means, standard deviations, and coefficients of variation of material resources: International comparisons

	instructional resources (min 6, max 24)			educational infrastructure (min 3, max 12)			budget for supplies (min 1, max 4)			number of computers available for instructional purposes			computers per student			class size		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Arab	15.35	4.81	0.31	8.57	2.86	0.33	3.29^	0.98	0.30	24.66	26.79	1.09	0.05	0.10	2.20	32.09	9.03	0.28
OECD	18.65	4.19	0.22	9.17	2.59	0.28	3.23	0.94	0.29	62.31	84.02	1.35	0.10	0.10	0.99	26.49	8.70	0.33
Other	13.15	5.25	0.40	7.78	2.80	0.36	2.72	1.10	0.40	20.15	30.67	1.52	0.02	0.03	1.16	36.30	13.08	0.36
TIMSS Average	16.25	4.20	0.26	8.68	2.57	0.30	3.10	0.91	0.29	40.73	26.93	0.66	0.03	0.03	1.11	29.56	6.98	0.24

Note: Arab countries include Bahrain, Egypt, Jordan, Kuwait, Lebanon, Palestinian Territories, Oman, Qatar, Saudi Arabia, Syria. OECD countries include Australia, Czech Republic, England, Hungary, Israel, Italy, Japan, Korea, Norway Slovenia, Sweden, Turkey, and the United States. Other includes Botswana, Colombia, El Salvador, Georgia, Ghana, Indonesia, Thailand, and Tunisia. All differences are significant at $p<0.05$ with the exception of those noted by ^.

Table 4.3 Means, standard deviations, and coefficients of variation of human resources: International comparisons

Groups	Teacher experience			Teacher education			Teacher professional development			% Math major			% Math education major			% certified		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Arab	11.46	8.58	0.75	4.73	0.87	0.18	0.72	0.44	0.61	0.74	0.44	0.60	0.53	0.50	0.94	0.82	0.38	0.47
OECD	16.43	11.06	0.67	5.20	0.68	0.13	0.86	0.34	0.40	0.51	0.50	0.97	0.61	0.49	0.80	0.96	0.19	0.20
Other	12.12	9.39	0.77	4.33	0.93	0.21	0.87	0.34	0.39	0.75	0.43	0.57	0.40	0.49	1.23	0.91	0.29	0.31
TIMSS Average	15.44	9.52	0.62	4.85	0.61	0.13	0.83	0.34	0.41	0.70	0.39	0.55	0.54	0.44	0.82	0.92	0.21	0.23

Note: Arab countries include Bahrain, Egypt, Jordan, Kuwait, Lebanon, Palestinian Territories, Oman, Qatar, Saudi Arabia, Syria. OECD countries include Australia, Czech Republic, England, Hungary, Israel, Italy, Japan, Korea, Norway Slovenia, Sweden, Turkey, and the United States. Other includes Botswana, Colombia, El Salvador, Georgia, Ghana, Indonesia, Thailand, and Tunisia. All differences are significant at $p<0.05$ with the exception of those noted by ^.

Table 4.4 Means, standard deviations, and coefficients of variation of curricular resources: International comparisons

	Weekly instructional time			Yearly instructional time			% time on math			% of students taught TIMSS topics		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Arab	182.45	84.08	0.46	111.36	50.46	0.45	11.19	5.23	0.47	71.92	16.31	0.23
OECD	187.53	45.32	0.24	115.31	27.51	0.24	12.06	2.86	0.24	74.27	15.95	0.21
Other	216.62	63.87	0.29	137.81	40.21	0.29	12.64	4.92	0.39	64.16	18.48	0.29
TIMSS Average	195.95	43.98	0.22	119.45	27.61	0.23	12.07	3.21	0.27	71.95	12.89	0.18

Note: Arab countries include Bahrain, Egypt, Jordan, Kuwait, Lebanon, Palestinian Territories, Oman, Qatar, Saudi Arabia, Syria. OECD countries include Australia, Czech Republic, England, Hungary, Israel, Italy, Japan, Korea, Norway Slovenia, Sweden, Turkey, and the United States. Other includes Botswana, Colombia, El Salvador, Georgia, Ghana, Indonesia, Thailand, and Tunisia. All differences are significant at $p<0.05$ with the exception of those noted by ^.

B. Human Resources. Table 4.3 shows that Arab eighth graders are taught by teachers with less years of experience, less education, less professional development, and less certification than their OECD counterparts. On most measures of teacher characteristics, the ACs fare worse than the OECD countries. Compared to their OECD counterparts, eighth graders in the ACs have teachers with 5 fewer years of experience and who are slightly less educated, but most students in most countries are taught by teachers with a tertiary degree. Returning to Table 4.3, a smaller proportion of Arab students have teachers who had participated in professional development in the previous two years. In addition, a smaller proportion of eighth graders in the ACs have teachers who are certified. A large proportion of Arab eighth graders are taught by teachers who majored in math, but only half of them have teachers who had pedagogical training in math education. Compared to the "Other" group, Arab eighth graders have less experienced teachers, fewer certified teachers, and fewer teachers who have participated in professional development. On five out of six measures of human resources, the ACs display higher levels of inequality than the OECD countries, and on three out of six measures, inequality is higher in the ACs than in the "Other" group.

Curricular Resources. Arab students spend slightly less time than their OECD counterparts on math instruction, when measured in weekly minutes, yearly hours, or as a proportion of total instructional time, as shown in Table 4.4. In addition, a lower proportion of Arab eighth graders are taught the TIMSS topics. Inequality is higher in the ACs than in the OECD (on all measures) and in the other group (on three out of four measures). For example, the coefficient of variation is higher in the Arab countries than in the other two regions for

weekly time, yearly time and percent of total time on math, indicating that student access to the resource of instructional time differs widely within the Arab region.

4.3 Intra-regional differences in educational resources

Material Resources. Within the Arab region, table 4.5 shows the eighth graders in the richer Gulf states attend schools with lower levels of material resources than students in the Mashrek. However, the richer Gulf countries have slightly higher budgets, more computers, and more computers per student. Class sizes are smaller in the Gulf states than in the Mashrek. Inequality in material resources is higher in the Gulf than in the Mashrek on four out of six measures.

Human Resources. Table 4.6 shows that eighth graders in the Gulf Arab countries are taught by less experienced but slightly more educated teachers than eighth graders in the Mashrek. Compared to 79 percent of Mashrek eighth graders, only 65 percent of Gulf eighth graders are taught by teachers who had participated in professional development in the preceding two years. A higher proportion of eighth graders in the Mashrek is taught by math majors than in the Gulf, where 63 percent are taught by math education majors. Almost all eighth graders in the Gulf are taught by certified teachers, whereas only three-fourths of Mashrek eighth grades have certified teachers. Inequality is higher in the Mashrek countries than in the Gulf on four out of six human resource measures.

Curricular Resources. In table 4.7, The Mashrek eighth graders spend slightly more time per week, but when measured by yearly hours, they spend slightly less time than their Gulf counterparts. It appears that while students in the Gulf Arab states are spending more time in math instruction, the coverage of topics is not as wide. Coverage of content is wider in the Mashrek than in the Gulf, where 67 percent of eighth graders are taught the TIMSS topics,

compared to 76 percent in the Mashrek. Inequality in the curricular resource measures is higher in the Gulf countries than in the Mashrek.

Table 4.5 Means, standard deviations, and coefficients of variation of material resources: Intra -regional comparisons

	instructional resources (min 6, max 24)			educational infrastructure (min 3, max 12)			budget for supplies (min 1, max 4)			number of computers available for instructional purposes			computers per student			class size		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Gulf	14.65	4.86	0.33	8.57^	2.95	0.34	3.33	0.96	0.29	34.35	34.44	1.00	0.06	0.06	1.00	29.92	7.84	0.26
Mashrek	16.05	4.64	0.29	8.57	2.76	0.32	3.24	0.99	0.31	16.86	14.27	0.85	0.04	0.13	3.39	34.04	9.57	0.28

Note: Gulf countries include Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. Mashrek countries include Lebanon, Palestinian Territories,Syria, Egypt, and Jordan. All differences are significant at $p<0.05$ with the exception of those noted by ^.

Table 4.6 Means, standard deviations, and coefficients of variation of human resources: Intra -regional comparisons

	Teacher experience			Teacher education			Teacher professional development			% Math major			% Math education major			% certified		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Gulf	10.68	7.91	0.74	5.02	0.42	0.08	0.65	0.48	0.74	0.67	0.47	0.70	0.63	0.48	0.76	0.91	0.28	0.31
Mashrek	12.21	9.13	0.75	4.46	1.08	0.24	0.79	0.40	0.51	0.80	0.40	0.50	0.44	0.50	1.14	0.75	0.43	0.57

Note: Gulf countries include Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. Mashrek countries include Lebanon, Palestinian Territories, Syria, Egypt, and Jordan. All differences are significant at $p<0.05$ with the exception of those noted by ^.

Table 4.7 Means, standard deviations, and coefficients of variation of curricular resources: Intra -regional comparisons

	Weekly instructional time			Yearly instructional time			% time on math			% of students taught TIMSS topics		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Gulf	180.31	90.25	0.50	112.98	56.16	0.50	11.24	5.74	0.51	67.28	16.68	0.25
Mashrek	184.39	78.00	0.42	110.16	45.78	0.42	11.15	4.75	0.43	76.18	14.72	0.19

Note: Gulf countries include Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. Mashrek countries include Lebanon, Palestinian Territories, Syria, Egypt, and Jordan. All differences are significant at $p<0.05$ with the exception of those noted by ^.

4.4 Country-level differences in educational resources

A. Material Resources. Table 4.8 shows the mean levels and distribution of material resources within each Arab country. Among the ACs, Saudi Arabia, an oil-rich nation, stands out as having among the lowest average levels (instructional resources, infrastructure, budget, computers) and the highest levels of inequality in instructional resources, infrastructure, and budget, computers, and class size. Within this group, Lebanon, the highest levels of instructional resources and infrastructure and lowest levels of inequality on these two measures. The smallest Gulf countries—Qatar and Kuwait—have the most computers in schools and computers-per-student. Syria and Palestine, two Mashrek countries, have the lowest numbers of computers per student. In terms of class sizes, Egypt and Palestine have the largest classes, while Lebanon and Qatar, and other Gulf countries, share the smallest class sizes. Saudi Arabia has among the lowest number of computers, and high inequality in that measure. Higher levels of resource availability seem to be associated with lower levels of inequality, and vice versa. For example, in Lebanon, which has higher levels if instructional resources, also has the lowest inequality in that resource. In Saudi Arabia, the opposite is true—low levels of instructional resources, and high levels of inequality. Similarly, Qatar and Bahrain, with the higher budget for supplies, have low levels of inequality around that measure, whereas Saudi Arabia and Oman, which have the lowest levels of that resource, show the highest inequality. This pattern is not always the case, however; Saudi Arabia has the largest inequality in class size, but does not have the largest classes. Another exception to this pattern is in Kuwait, for example, which has one of the highest computer-to-student ratios, but also one of the highest measures of inequality.

As far as material resources go, the pattern is mixed. While they have lower levels of instructional resources and infrastructure, they have smaller class sizes and more technology.

They show higher levels of inequality on four out of the six resource measures. Saudi Arabia, one of the oil-rich countries, stands out as having among the lowest resources and the highest inequalities on a number of material resource measures. Class sizes in the oil-rich countries are smaller, although whether this is a result of specific policies or the smaller size of the country itself is not known. Interestingly, Lebanon stands out as having the highest level of instructional resources and most adequate infrastructure, and along the lowest levels of inequality on these measures.

Table 4.8 Means, standard deviations, and coefficients of variation of material resources: Country-level comparisons

	instructional resources (min 6, max 24)			educational infrastructure (min 3, max 12)			budget for supplies (min 1, max 4)			number of computers available for instructional purposes			computers per student			class size		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Bahrain	15.47	4.51	0.29	9.69	2.44	0.25	3.71	0.64	0.17	35.37	25.49	0.72	0.05	0.04	0.72	30.71	3.81	0.12
Kuwait	14.21	4.80	0.34	8.67	2.61	0.30	3.55	0.79	0.22	39.89	36.22	0.91	0.07	0.08	1.18	29.84	5.24	0.18
Saudi Arabia	12.41	4.59	0.37	7.82	3.06	0.39	3.00	1.13	0.38	13.00	18.16	1.40	0.05	0.08	1.50	30.42	13.34	0.44
Oman	15.27	4.51	0.30	7.02	3.01	0.43	2.66	1.04	0.39	29.49	23.18	0.79	0.04	0.03	0.77	31.60	5.71	0.18
Qatar	15.68	5.14	0.33	9.69	2.60	0.27	3.73	0.56	0.15	45.75	47.48	1.04	0.09	0.05	0.63	26.89	6.34	0.24
Palestine	14.54	4.56	0.31	8.41	2.84	0.34	3.13	1.01	0.32	16.19	7.94	0.49	0.02	0.01	0.55	37.97	7.57	0.20
Jordan	16.31	4.45	0.27	7.75	2.90	0.37	3.55	0.78	0.22	27.41	17.93	0.65	0.04	0.03	0.65	35.38	9.36	0.26
Lebanon	17.47	4.22	0.24	9.77	2.51	0.26	3.17	1.10	0.35	16.80	12.78	0.76	0.04	0.04	1.16	26.48	8.59	0.32
Syria	15.15	4.93	0.33	8.47	2.51	0.30	3.00	1.03	0.34	8.54	7.75	0.91	0.02	0.03	1.12	31.33	8.71	0.28
Egypt	16.89	4.38	0.26	8.50	2.63	0.31	3.36	0.92	0.27	15.17	14.77	0.97	0.06	0.28	4.57	38.60	7.98	0.21

Table 4.9 Means, standard deviations, and coefficients of variation of human resources: Country-level comparisons

	teacher experience			teacher education			Professional development			% math major			% math education major			% certified		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Bahrain	11.89	7.33	0.62	5.03	0.50	0.10	0.81	0.39	0.48	0.62	0.48	0.78	0.73	0.44	0.61	0.98	0.15	0.15
Kuwait	12.37	7.51	0.61	5.02	0.24	0.05	0.89	0.31	0.35	0.62	0.49	0.79	0.62	0.49	0.78	0.84	0.37	0.44
Saudi Arabia	10.59	7.44	0.70	4.95	0.34	0.07	0.61	0.49	0.81	0.70	0.46	0.66	0.47	0.50	1.06	na	na	na
Oman	5.41	4.34	0.80	4.99	0.18	0.04	0.77	0.42	0.55	0.71	0.45	0.64	0.74	0.44	0.60	0.93	0.26	0.28
Qatar	13.55	9.10	0.67	5.09	0.61	0.12	0.75	0.43	0.58	0.70	0.46	0.65	0.66	0.47	0.72	0.89	0.31	0.35
Palestine	11.52	9.70	0.84	4.71	0.84	0.18	0.71	0.46	0.65	0.78	0.41	0.53	0.48	0.50	1.05	0.64	0.48	0.75
Jordan	9.91	7.89	0.80	4.91	0.75	0.15	0.90	0.30	0.34	0.86	0.34	0.40	0.44	0.50	1.13	0.79	0.41	0.52
Lebanon	14.12	10.79	0.76	4.25	1.43	0.34	0.87	0.34	0.39	0.77	0.42	0.55	0.41	0.49	1.20	0.72	0.45	0.63
Syria	11.35	8.59	0.76	3.50	0.78	0.22	0.57	0.49	0.86	0.92	0.27	0.30	0.17	0.38	2.18	0.82	0.38	0.46

Egypt	14.30	7.54	0.53	4.96	0.68	0.14	0.86	0.35	0.41	0.63	0.48	0.77	0.75	0.44	0.58	0.81	0.39	0.48

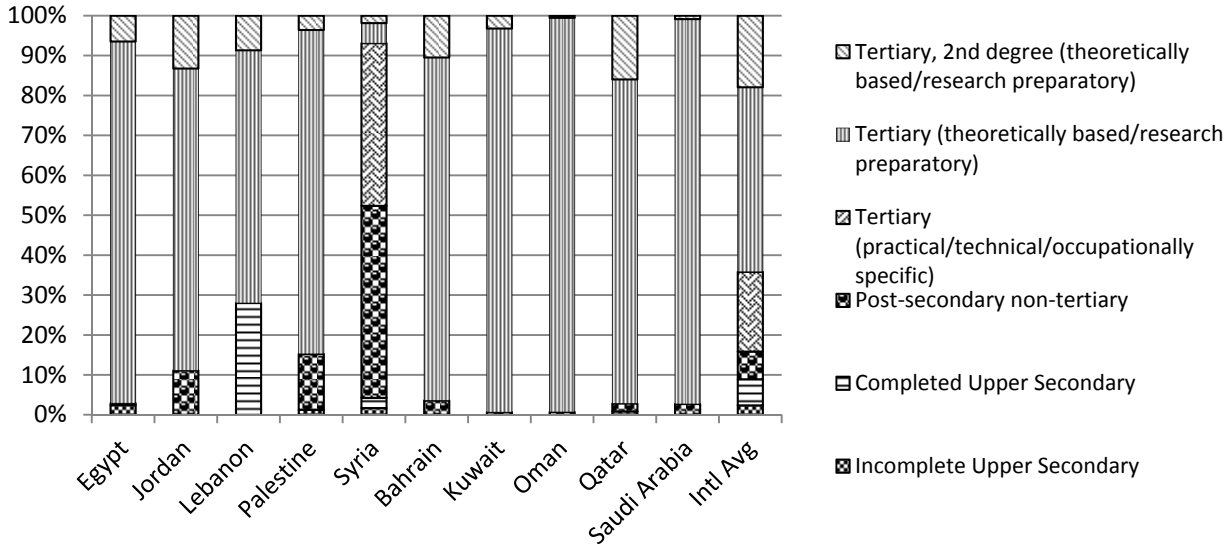
Table 4.10 Means, standard deviations, and coefficients of variation of curricular resources: Country-level comparisons

	Weekly instructional time			Yearly instructional time			% time on math			% of students taught TIMSS topics		
	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v	$\bar{x}$	s	c_v
Bahrain	154.52	94.16	0.61	95.89	57.58	0.60	9.46	6.05	0.64	70.15	13.30	0.19
Kuwait	80.60	75.51	0.94	49.94	46.05	0.92	5.82	5.33	0.92	66.22	16.85	0.25
Saudi Arabia	173.70	45.71	0.26	106.67	32.09	0.30	10.58	2.96	0.28	54.44	16.38	0.30
Oman	247.46	78.80	0.32	149.53	50.70	0.34	15.49	5.34	0.34	79.14	11.09	0.14
Qatar	218.34	49.06	0.22	138.29	31.50	0.23	13.02	2.88	0.22	65.39	15.71	0.24
Palestine	164.34	72.79	0.44	99.81	43.27	0.43	10.88	4.74	0.44	73.09	11.07	0.15
Jordan	224.04	22.85	0.10	141.35	16.12	0.11	13.57	2.45	0.18	84.17	10.91	0.13
Lebanon	262.10	56.17	0.21	145.43	32.29	0.22	15.10	2.85	0.19	73.73	14.29	0.19
Syria	137.46	65.00	0.47	75.97	37.68	0.50	9.70	4.75	0.49	64.62	14.87	0.23
Egypt	154.24	84.16	0.55	93.28	50.10	0.54	8.15	4.74	0.58	85.17	11.34	0.13

B. Human Resources. Table 4.9 shows an inconsistent pattern among the Mashrek and the Gulf countries. In the previous section, we saw that teacher experience was lower in the Gulf. Specifically, in table 4B, we see that Omani students have the least experienced teachers, while in Egypt, Lebanon, and Qatar, eighth graders have the most experienced teachers. Relatively, Egypt and the small Gulf countries have the lowest inequality on this measure.

Levels of teacher education are lowest in Lebanon and Syria, where inequality in this measure is the highest. Otherwise, teacher education is high and relatively equal across countries. Figure 4.1 is a visual representation of the proportion of students taught by teachers with various levels of education. The bars with the vertical lines represent tertiary education, and we can see that a large portion of students in each country are taught by teachers with theoretically-based tertiary education. In the case of Syria, however, greater portions of students have teachers who have not completed tertiary levels or completed a vocational type of training.

Figure 4.1 Teachers' highest level of education completed in Arab countries



In Oman, Kuwait, Bahrain, and Saudi Arabia, the coefficient of variation for teacher education is under 0.10, which is equitable. Syria also fares poorly in terms of teacher professional development: only 57 percent of Syrian eighth graders taught by math teachers who have undergone some type of professional development in the previous two years. Compounded by lower teacher education, the low rate of professional development points to a potential issue to be explored further regarding teacher quality in Syria. Saudi Arabia also under resources teacher professional development; only 61 percent of Saudi Arabian eight graders had a teacher who had participated in professional development in the two previous years. In terms of what teachers study, Syria and Jordan have the highest proportion of students taught by math majors—92 percent and 86 percent respectively. Dispersion in these countries is the lowest among the ACs. When it comes to having pedagogical training in math, Egypt and Oman have the highest proportion of students who had a teacher who majored in math education. Syria and Saudi Arabia, the countries with the lowest proportion of professional development, also had the lowest proportion of math education majors. In Saudi Arabia and Syria, only 17 percent of eighth graders are taught by teachers who have majored in math education. We can infer that eighth graders in Syria and Saudi Arabia are taught mostly by teachers who have majored in math (and not math education) and who do not undergo regular professional development. This combination reveals a potential area for improvement of opportunities for teacher training in these two countries.

In Bahrain, Kuwait, and Egypt, around 62 percent of eighth graders are taught by math teachers who have majored in math (this variable is also dispersed more widely in these countries). In general, lower proportions of eighth graders taught by math education majors than by math majors. In Bahrain, Oman, and Egypt, around three-fourths of eighth graders have

teachers who majored in math education. Inequality of math education major is lowest in the latter two countries. Most eight graders in most Arab countries are taught by certified teachers. In Bahrain and in Oman, more than 90 percent of eighth graders have certified teachers, and distribution of this resource is the most equitable in Bahrain. At the low extreme, in Palestine, only 64 percent of eighth graders have certified teachers, and certification varies widely among eighth graders.

C. Curricular Resources. The time spent on mathematics instructions varies considerably among the ACs, as shown in table 4.10. When measured in weekly minutes, Lebanon and Oman spend the most time, and inequality is lowest in Lebanon. eighth graders in Kuwait spend the least time on math, and this varies widely among students. When measured in yearly hours (taking into account the number of instructional days in the school year), eighth graders in Oman and Lebanon spend the most time on math. Kuwait, Bahrain, and Egypt spend fewer hours. The distribution in the most equal in Lebanon and Jordan, and most unequal in Kuwait, Bahrain, and Egypt. Oman and Lebanon also fare well when instructional time is measured as a proportion of total time (followed by Jordan). Kuwait, Bahrain, and Egypt spend the least amount of time, and the distribution matches that of yearly time. In terms of content coverage, most eighth graders in Jordan and Egypt had been taught the TIMSS topics. The lowest proportion of eighth graders taught the TIMSS topics were in Saudi Arabia, Qatar, and Syria. The variation in coverage was widest in Saudi Arabia.

4.5 Within country differences in educational resources

The previous section showed how the Arab region compared to other regions in terms of educational resources. This section will show how these educational resources are distributed across students in different countries. I examine the distribution of resources along three

dimensions: 1) gender, 2) SES, and 3) school sector. I begin by establishing the relationship between these variables and achievement. Following this, I explore whether the patterns observed in achievement differences are matched by similar resource differences.

Table 4.11 shows that girls outperform boys in eight out of ten Arab countries. In the two countries were boys outperform girls—Lebanon and Syria, both Mashrek countries—the achievement difference is relatively small in magnitude. In general, gender explains a very small proportion of the variation in achievement. The pattern in the Arab countries is markedly different than the pattern for gender differences in achievement in OECD countries, where the statistically insignificant differences ranged from 0-5 points (results for OECD not shown here). Oman has one of the highest levels of gender differences in achievement, with a 50-point difference.

Table 4.11 Achievement differences by gender

	Girls	Boys	Difference	R^2
Mashrek				
Lebanon	443.39	456.95	-13.56	0.01
Jordan	437.57	417.18	20.39	0.01
Egypt	397.27	384.05	13.22	0
Palestine	385.07	349.18	35.89	0.03
Syria	386.35	403.33	-16.98	0.01
Gulf				
Saudi Arabia	341.12	318.54	22.58	0.02
Bahrain	415.36	381.21	34.15	0.04
Kuwait	363.8	342.04	21.76	0.02
Qatar	327.18	295.3	31.88	0.03
Oman	398.58	345.69	52.89	0.08

Note: All differences are statistically significant at $p < 0.05$.

When comparing the achievement of high (top third) and low (bottom third) SES students, I find that there are significant differences between across all Arab countries. Results are presented in table 4.12. In all cases, those in the bottom third performed worse than those in

the top third of the SES scale. In absolute terms, this difference was greatest in Qatar, Jordan, and Lebanon. Countries where SES explained a relatively larger proportion of the variance achievement are Lebanon (15%), followed by Saudi Arabia (13%) and Bahrain (11%).

Table 4.12 Achievement differences by SES

	Low	High	Difference	R^2
Mashrek				
Lebanon	431.56	490.58	-59.02	0.15
Jordan	408.64	469.54	-60.9	0.09
Egypt	382.55	433.32	-50.77	0.06
Palestine	357.19	404.27	-47.08	0.06
Syria	387.53	423.69	-36.16	0.05
Gulf				
Saudi Arabia	309.86	366.14	-56.28	0.13
Bahrain	377.95	432.24	-54.29	0.11
Kuwait	334.27	380.74	-46.47	0.09
Qatar	286.51	346.81	-60.3	0.1
Oman	358.94	405.4	-46.46	0.07

Note: All differences are statistically significant at $p < 0.05$.

In countries where information on school sector is available, public school students perform worse than private schools students in every case (Lebanon, Bahrain, Jordan[12], and Palestine[13]). Table 4.13 shows that the achievement difference is greatest in Bahrain and Lebanon, where sector explains a high proportion of the variation in achievement, 9 percent and 18 percent, respectively. Both the achievement difference and the proportion of variance explained by sector point to a potentially large source of inequality in Bahrain and Lebanon. These differences will be explored in greater detail in the next chapter.

Table 4.13 Achievement differences by sector

	Public	Private	Difference	R^2
Lebanon	412.89	477.33	-64.44	0.18
Bahrain	390.33	479.16	-88.83	0.09
Jordan	410.09	469.93	-59.84	0.07

[12] In Jordan, public schools were compared to private schools, United Nations Relief and Works Agency (UNRWA) run schools for refugees, and Discovery schools, which are schools for refugees, and "Discovery schools", which are run by special public-private initiatives.

[13] In Palestine, public schools were compared to private schools and UNRWA schools.

Palestine	355.75	387.64	-31.90	0.02

Note: All differences are statistically significant at $p < 0.05$.

Gender Resource Differences

Contrary to common perceptions, there was no consistent evidence of girls attending schools with fewer resources than boys. As tables 4.14, 4.15 and 4.16 show, differences between boys and girls access to educational resources are generally small, and few are statistically significant. In Oman, where the achievement difference was the largest, there are differences in teacher's major: girls' teachers were more likely to have majored in math education, while boys' teachers were more likely to have majored in math. Boys' teachers were also slightly less experienced. In Lebanon and Syria, where boys do better, resources are distributed fairly equally among the boys and girls. In Qatar, there are differences on a number of measures. Eighth grade girls in Qatar attend larger classes on average, and have teachers who are significantly less experienced than boys' teachers, who are less likely to be certified, and less likely to have participated in professional development.

Table 4.14 Within country gender differences in material resources

	Instructional Resources			Infrastructure			Budget			Computers			Computers per student			Class size		
Country	F	M		F	M		F	M		F	M		F	M		F	M	
Bahrain	16.28	14.71		9.90	9.50		3.59	3.82		41.18	29.35		0.05	0.05		30.84	30.58	
Egypt	16.69	17.09		8.44	8.56		3.26	3.46		15.33	15.02		0.04	0.08		39.37	37.85	
Jordan	16.24	16.37		7.82	7.68		3.43	3.66		28.58	26.34		0.05	0.04		36.00	34.80	
Kuwait	14.19	14.25		8.43	8.95		3.56	3.55		40.08	39.61		0.07	0.06		29.46	30.34	
Lebanon	17.38	17.57		9.71	9.84		3.13	3.22		16.26	17.43		0.03	0.04		26.58	26.35	
Oman	15.76	14.76		6.89	7.16		2.65	2.67		29.99	28.92		0.04	0.04		32.06	31.11	
Palestine	15.43	13.58	*	8.77	8.03		3.05	3.21		16.21	16.16		0.02	0.02		38.75	37.21	
Qatar	14.89	16.53	*	9.09	10.33	*	3.68	3.78	*	49.45	42.37	*	0.09	0.09	*	28.42	25.47	*
Saudi Arabia	11.54	13.25	*	7.44	8.18		3.04	2.97		10.20	14.96		0.04	0.06		33.23	28.15	*
Syria	15.44	14.83		8.71	8.20		3.03	2.97		8.04	9.09		0.02	0.02		31.88	30.72	

Note: Starred values are significantly different at $p < 0.05$. F = female, M=male.

Table 4.15 Within country gender differences in human resources

	Teacher experience			Teacher education			Professional Development			Math major			Math education major			Certified		
	F	M		F	M		F	M		F	M		F	M		F	M	
Bahrain	9.56	14.09		4.97	5.09		0.76	0.85		0.44	0.79		0.81	0.66		0.98	0.97	
Egypt	15.09	13.58		4.84	5.07		0.87	0.84		0.64	0.62		0.73	0.69		0.82	0.79	
Jordan	9.63	10.19		4.95	4.87		0.93	0.87	*	0.90	0.83		0.38	0.50		0.77	0.81	
Kuwait	9.37	15.86	*	5.02	5.02		0.85	0.93		0.59	0.64		0.56	0.66		0.76	0.92	*
Lebanon	13.81	14.47		4.21	4.29		0.85	0.89		0.76	0.78		0.40	0.40		0.72	0.70	
Oman	6.17	4.61	*	5.01	4.97		0.71	0.83		0.57	0.87	*	0.83	0.62	*	0.96	0.90	
Palestine	9.71	13.31	*	4.73	4.68		0.74	0.67		0.78	0.78		0.49	0.45		0.59	0.68	
Qatar	8.91	18.10	*	5.05	5.12	*	0.65	0.85	*	0.61	0.79	*	0.71	0.59	*	0.85	0.94	*
Saudi Arabia	9.14	11.92		4.96	4.95		0.66	0.56		0.66	0.73		0.45	0.41		na	na	
Syria	11.84	10.82		3.48	3.53		0.58	0.57		0.95	0.89	*	0.16	0.19		0.86	0.79	

Note: Starred values are significantly different at $p < 0.05$. F = female, M=male.

Table 4.16 Within country gender differences in curricular resources

	weekly time			yearly time			% on math			% taught TIMSS		
	F	M		F	M		F	M		F	M	
Bahrain	147.52	160.62		93.87	97.81		9.23	9.66		67.31	72.80	*
Egypt	158.05	150.57		99.21	87.80		8.38	7.92		85.46	85.27	
Jordan	220.62	227.18	*	138.83	143.67	*	13.13	14.00	*	85.29	83.15	
Kuwait	79.50	81.87		52.73	45.90		5.43	6.30		64.06	68.37	
Lebanon	261.49	262.80		144.24	146.76		15.03	15.19		73.45	73.70	
Oman	248.22	246.61		150.27	148.63		15.38	15.60		79.99	77.95	
Palestine	177.79	151.06	*	109.41	90.03	*	11.67	10.11	*	73.18	73.27	
Qatar	226.71	209.73	*	139.32	137.32	*	12.78	13.22	*	62.54	67.69	*
Saudi Arabia	175.53	172.03		108.64	105.22		10.55	10.61		54.66	55.43	
Syria	144.05	130.14		80.43	70.80		10.06	9.31		63.03	66.54	*

Note: Starred values are significantly different at $p < 0.05$. F = female, M=male.

SES Resource Differences

Tables 4.17, 4.18 and 4.19 show that across Arab countries, students in the bottom third SES attend schools with lower levels of material resources, especially in Lebanon, Egypt, and Jordan, and Qatar. Generally, these differences are small in magnitude. Human and curricular resources appear to be more equally distributed, with a few exceptions. Countries that exhibit a pattern of a disadvantage for low SES include Bahrain in curricular resources, where low SES students spend less instructional time on math, whether measured in weekly minutes, yearly hours, or as a proportion of total instructional time.

Sector Resource Differences

The largest public-private differences were in material resources, as shown in table 4.20. In general students in public schools Lebanon, Bahrain, Jordan, and Palestine are more likely to attend schools that experience more severe shortages or inadequacies in instructional resources, infrastructure, the budget for supplies, and in available computers for student use. Public school students in Bahrain attend classes that have 10 students more than classes attended by their private school counterparts. In other countries, however, public school student classes are slightly smaller. In terms of human resources, table 4.21 shows less consistent patterns. Public school students in Palestine and Bahrain are less likely to have teachers who participated in professional development. In Palestine and Jordan, public school eighth graders are less likely than their private school counterparts to have certified teachers. In terms of curricular resources, Bahraini eighth graders in public schools spend less of their time on math instruction than private school students. Curricular differences in the other countries were not statistically significant, as shown in Table 4.22.

The results presented above indicate that Arab students attend schools with fewer resources than their OECD counterparts, but they are slightly better-off than students in the group of low-performing, middle-to-low income countries. Inequality is higher in the ACs than in the OECD. Within the region, eighth graders in the richer Gulf countries do not necessarily attend schools that are better-resourced than their Mashrek counterparts, and there was no consistent pattern of greater inequality. Among countries, Saudi Arabia (Gulf) and Syria (Mashrek), both large countries, stood out as consistently having the lowest levels of resources and highest inequality. The next chapter discusses sector differences in two countries where sector represented a large source of inequality.

Table 4.17 Within country SES differences in material resources

	Instructional Resources			Infrastructure			Budget			Computers			Computers per student			Class size		
Country	high	low		high	low		high	low		high	low		high	low		high	low	
Bahrain	15.78	15.25	*	9.83	9.48	*	3.74	3.65	*	37.94	34.22	*	0.05	0.05		30.21	31.10	*
Egypt	17.58	16.61	*	9.07	8.07	*	3.49	3.26	*	18.32	13.54	*	0.05	0.05		37.30	39.03	*
Jordan	17.16	15.68	*	8.39	7.31	*	3.64	3.48	*	30.69	25.38	*	0.04	0.05		34.92	34.89	
Kuwait	13.94	14.52		8.63	8.70		3.49	3.64	*	41.62	39.17		0.07	0.07		29.94	29.69	
Lebanon	18.73	16.71	*	10.41	9.41	*	3.54	2.99	*	23.14	12.81	*	0.04	0.03		27.41	26.04	
Oman	15.50	15.38		6.95	7.18		2.68	2.71		29.55	28.72		0.04	0.05	*	31.76	30.71	
Palestine	14.97	14.28	*	8.57	8.30		3.13	3.06		16.72	15.85	*	0.03	0.02		37.45	38.34	
Qatar	16.55	14.72	*	9.97	9.26	*	3.77	3.67	*	50.65	42.29	*	0.09	0.08	*	26.40	27.59	*
Saudi Arabia	13.20	11.75	*	8.30	7.51	*	3.19	2.88	*	14.86	11.26	*	0.05	0.05		32.44	29.17	*
Syria	15.03	14.93		8.76	8.32	*	3.13	2.92	*	8.90	8.05		0.02	0.02		31.91	30.61	

Note: High and low refer to top and bottom thirds of SES, respectively.

Table 4.18 Within country SES differences in human resources

	Teacher experience			Teacher education			Professional Development			Math major			Math education major			Certified		
	high	low		high	low		high	low		high	low		high	low		high	low	
Bahrain	11.88	11.90		5.04	5.01		0.84	0.81	*	0.62	0.62		0.74	0.74		0.99	0.97	
Egypt	15.99	13.49	*	4.96	4.96		0.88	0.85		0.69	0.61		0.69	0.73		0.77	0.80	
Jordan	10.68	9.10	*	4.87	4.93		0.91	0.89		0.83	0.90		0.46	0.42		0.82	0.76	
Kuwait	12.74	11.89		5.01	5.03		0.89	0.90		0.58	0.65		0.58	0.62		0.82	0.84	
Lebanon	14.70	15.18		4.31	4.16		0.88	0.85		0.81	0.73		0.39	0.40		0.73	0.70	
Oman	5.87	5.65		5.00	4.99		0.80	0.76	*	0.69	0.68		0.76	0.73		0.93	0.93	

Palestine	12.49	10.59	*	4.71	4.74		0.72	0.73		0.79	0.78		0.49	0.46		0.62	0.64		
Qatar	12.84	14.00	*	5.06	5.13	*	0.77	0.75	*	0.73	0.67	*	0.62	0.70	*	0.91	0.87	*	
Saudi Arabia	10.97	10.43		4.91	4.98		0.64	0.60		0.67	0.73		0.41	0.42		na	na		
Syria	13.79	9.97	*	3.58	3.51		0.58	0.58		0.96	0.90	*	0.18	0.16		0.84	0.83		

Note: High and low refer to top and bottom thirds of SES, respectively.

Table 4.19 Within country SES differences in curricular resources

	weekly time			yearly time			% on math			% taught TIMSS		
	high	low		high	low		high	low		high	low	
Bahrain	163.15	144.26	*	102.27	88.12		9.84	8.99	*	69.69	70.52	
Egypt	147.34	156.82		92.54	95.60		7.89	8.26		86.39	85.16	
Jordan	223.12	224.88		140.48	142.15		13.33	13.71	*	84.83	84.18	
Kuwait	79.36	81.43		50.60	51.46		5.77	5.73		66.48	66.08	
Lebanon	259.65	259.53		142.27	143.37		15.05	14.98		73.47	73.85	
Oman	250.58	242.36		151.85	146.70		15.35	15.60		78.82	79.66	
Palestine	169.34	162.40		103.11	99.19		11.20	10.68	*	73.57	72.69	
Qatar	222.06	216.22	*	139.33	137.02		13.01	12.98		67.26	63.25	*
Saudi Arabia	173.05	174.20		108.56	105.14		10.12	10.85	*	55.98	54.50	
Syria	138.91	137.20		75.92	75.09		9.77	9.67		63.25	66.11	*

Note: High and low refer to top and bottom thirds of SES, respectively.

Table 4.20 Within country sector differences in material resources

	Instructional Resources			Infrastructure			Budget			Computers			Computers per student			Class size		
Country	private	public		private	public		private	public		private	public		private	public		private	public	
Lebanon	18.70	16.12	*	10.60	8.82	*	3.56	2.77	*	22.92	8.76	*	0.04	0.03	*	27.01	25.83	
Palestine	16.41	13.44	*	8.96	8.05	*	3.35	3.04	*	23.14	12.12	*	0.03	0.02	*	40.17	36.63	*
Jordan	17.65	15.79	*	8.53	7.45	*	3.61	3.53	*	31.74	25.72	*	0.04	0.05		35.66	35.26	*

Bahrain	17.22	15.85	*	11.15	9.67	*	3.92	3.69	*	49.23	35.67	*	0.06	0.05	*	22.11	31.32	*

Table 4.21 Within country sector differences in human resources

	Teacher experience			Teacher education			Professional Development			Math major			Math education major			Certified		
	private	public		private	public		private	public		private	public		private	public		private	public	
Lebanon	13.89	15.93		4.30	4.16		0.86	0.88		0.79	0.72		0.39	0.41		0.66	0.77	
Palestine	13.71	10.48	*	4.91	4.60		0.96	0.58	*	0.83	0.76		0.67	0.35	*	0.78	0.56	*
Jordan	11.76	9.22		4.74	4.98	*	0.88	0.91		0.79	0.89		0.52	0.41		0.87	0.76	*
Bahrain	11.54	11.78	*	5.30	5.05		0.92	0.82	*	0.55	0.64		0.69	0.73		1.00	0.97	

Table 4.22 Within country sector differences in curricular resources

	weekly time			yearly time			% on math			% taught TIMSS		
	private	public		private	public		private	public		private	public	
Lebanon	262.00	259.09		146.03	140.06		15.32	14.50		74.18	73.09	
Palestine	168.46	161.81		96.87	101.09		10.24	11.21		75.19	72.24	
Jordan	228.23	222.41		141.35	141.36		13.81	13.48		85.65	83.59	
Bahrain	214.55	150.52	*	124.79	92.75	*	11.70	9.29	*	71.84	70.00	

Chapter 5

Public-Private Differences in Lebanon and Bahrain

The previous chapter showed significant differences in resources and achievement between public and private schools in the 4 countries where information on school sector was made available. In this chapter, I select Lebanon (a Mashrek country) and Bahrain (a Gulf country) as two cases in which to explore these sectoral differences further. These countries were chosen for further examination for two reasons: first, they are countries in which the achievement differences between public and private school students are greatest, and second, they are countries in which school sector explains a sizeable portion of the variance in achievement. The first section of this chapter describes the educational contexts in these two countries. The remainder of the chapter details student achievement by sector, and describes the characteristics of students who attend public and private schools in Lebanon and Bahrain.

Bahrain and Lebanon differ in terms of political organization, economic power, size, and experience with modern education. Bahrain is a very small island nation, with a population of less than one million people. Its economy is heavily dependent on oil, with petroleum production and refining accounting for more than 60 percent of exports. As a result, the country's GNI per capita is among the highest in the region. Bahrain is a monarchy, and 80 percent of the population is Muslim. Recently, economic deprivation and systemic government discrimination against the majority Shiite population has been a major source of unrest in Bahrain, where basic services such as housing, education, and the energy grid are overstretched (Ulrichsen, 2009). Historically, Bahrain's position between the Gulf region and India made it a center for trade and

travel, and idea exchange. The result was an attitude favorable to new ideas and education, and as such Bahrain was the first Gulf state to introduce a modern system of education. The first public school was opened in 1921 (Al-Misnad, 1985). In contrast, Lebanon differs from Bahrain in several aspects. The Lebanese population is larger and more heterogeneous, including around 40 percent Christians of various denominations. Lebanon has witnessed significant episodes of violence and civil unrest in the past thirty years, although the severity of the violence has varied at different periods. Educationally, Lebanon's experience with modern systems began earlier than it did in Bahrain, due to Ottoman, colonial, and other missionary influences. The various religious communities referred to earlier established their own schools, and as a result, Lebanon is unique in its prevalence of private schools, religious and secular.

The private systems in Lebanon and Bahrain are different in terms of reach and coverage. As can be seen in the first row of table 5.1, the Lebanese system is highly privatized, with almost 60 percent of eighth graders attending private schools; in Bahrain the private system is much smaller, with around 9 percent of eighth graders attending private schools. Private schools in Bahrain are divided into three types: national private schools, foreign private schools, and foreign community schools. Each school has its own curriculum, teaching plans, and textbooks approved by the Ministry of Education. Private schools are obligated to use the curriculum and textbooks that the ministry approves concerning the Arabic language for Arab students, Islamic studies for Muslim students, and Bahrain history and geography for all students. Presently, the total number of public schools is 205, and the number of private schools is 66 (TIMSS 2007 Encyclopedia).

However, the differences in achievement between public and private school students follow a similar pattern in both countries, where, a high proportion of public school students do

not reach the low international benchmark set by TIMSS. Less than 2 percent of public school students reach the high benchmark—compared to 10 percent of private school students—and few to no public school students reach the advanced benchmark in Bahrain and Lebanon.

Table 5.1. A comparison of public and private student and school characteristics in Lebanon and Bahrain.

	Lebanon		Bahrain	
	Public	Private	Public	Private
% attending type	41.38	58.62	91.37	8.63
Student achievement				
% not reaching low	38.28	11.96	54.01	12.76
% reaching low benchmark	44.27	30.89	30.61	31.41
% reaching intermediate	16.20	39.05	13.41	41.04
% reaching high	1.25	16.49	1.92	12.43
% reaching advanced	0.00	1.60	0.05	2.36
Student background				
gender				
female	59.01	51.93	50.31	43.24
male	40.99	48.07	49.69	56.76
% having books at home				
0-25	59.88	41.03	46.00	29.04
26-100	25.11	33.49	31.98	33.82
101-200	7.21	12.98	12.16	21.46
over 200	7.80	12.50	9.86	15.67
parents highest level of education				
lower secondary or less	53.83	19.20	22.75	1.67
upper secondary	19.59	18.60	34.87	6.59
post-secondary	18.08	25.89	8.04	8.99
university	8.50	36.31	18.26	50.57
student born in country	76.11	83.53	86.99	81.34
parents born in country				
both parents born in country	87.04	88.56	78.49	68.40
only one parent	10.46	9.31	9.38	17.99
neither parent	2.50	2.13	12.13	13.61
home possessions index	3.35	3.99	3.66	4.35
SES (average)	-0.61	0.24	0.87	-0.10
School background				
% disadvantaged				
0-25%	15.26	40.66	40.68	97.77
26-50%	8.20	20.78	38.25	2.23

more than 50%	76.53	38.57	21.07	0
size of community				
15,000 or fewer	47.29	37.99	43.07	15.84
15,000-100,000	37.92	33.41	43.85	57.00
more than 100,000	14.79	28.60	13.08	27.16

Characteristics of students who attend public and private schools are somewhat similar in the two countries, but there are clear differences as well. Girls are overrepresented in public schools in Lebanon (and tend to do worse than boys). In Bahrain, boys are overrepresented in private schools. In terms of family background, public school students have fewer books in the home than private school students in both countries. Parental education is one area where the students in the public and private school systems differ between countries. In Lebanese public schools, half of students have parents who have only completed lower secondary school, and only 8 percent of students in public school have parents who have a university degree, indicating a high degree of segregation among students by parental education. The distribution of parental education among private school students in Lebanon is more spread than that in public schools. In Bahrain, the picture is slightly different. Half of students in private school have parents with a university degree, compared to 18 percent of public school students, suggesting that in Bahrain, the most highly educated families opt for private schools. While specific nationalities of students are not available, the data show that in both countries and for both public and private schools, the majority of students' parents were born in the country, indicating that most are native students. In both Lebanon and Bahrain, roughly equal proportions of students had neither parent born in the country in public and private schools. In other words, if a parent being born in the country is

an indicator of nationality, then children of non-nationals are as likely to attend public schools as they are private schools.

The social contexts of the schools that public and private school students attend are also markedly different. 76 percent of public schools in Lebanon (compared to 21% in Bahrain) have more than half of the student population coming from economically disadvantaged backgrounds. Almost 40 percent of Lebanese private school students have a majority student population that is economically disadvantaged. A likely cause for this is the widespread presence of religious private schools and free public schools that operate like charter schools. In Bahrain private schools seem to be strictly elite serving, with very low incidences of economically disadvantaged student populations. Public schools in Lebanon are less likely to be located in the largest communities, suggesting that they may be more prevalent in rural areas, but private schools are equally distributed across categories of community sizes. In Bahrain, private schools are less likely to be in smaller communities, and public schools are less likely to be in larger communities.

Several interesting patterns emerge from a close examination of Table 5.1. The private systems in Bahrain and Lebanon are clearly different. In Bahrain, the private system is an elite system in that it caters to small but highly educated, economically affluent population, while in Lebanon, private schools are more prevalent than public ones, and the student populations in private schools come from more diverse socioeconomic backgrounds. However, what is striking is the extent to which Lebanese public serve only the most disadvantaged youth, as suggested by the proportion of students whose parents have a low educational levels and the fraction of public schools that have a majority of students from economically disadvantaged backgrounds. In Bahrain, the correlation between SES and sector is -0.27 ($p=0.02$) and in Lebanon, this

correlation is -0.42 (p=0.03). Next, I show the proportions of students from different SES background attending public and private schools.

Table 5.2. Percentages of students attending public and private schools by position on SES scale

	Lebanon		Bahrain	
	Public	Private	Public	Private
Top third	16.42	83.58	83.35	16.65
Middle third	35.76	64.24	94.78	5.22
Bottom third	63.24	36.76	99.48	0.52

The likelihood of students from differing SES backgrounds of attending either public or private school vary from Lebanon to Bahrain, as shown in Table 5.2, although the pattern of decreased likelihood of attending private school for lower SES is similar. For example, in Lebanon, where more students attend private school in general, students from the top third of the SES scale are more likely to go to private school than to public school. Students from the middle of the SES scale are also more likely to attend private school, where as students from the bottom third are more likely to go to public school. In Bahrain, students from the top third are more likely to go to public school, which may seem like an anomaly but is actually not given the proportion of private schools in the country. However, students from the middle and bottom thirds of the SES scale still attend public schools at higher rates, and very few students from the middle and bottom third attend private schools.

These patterns have serious implications for equality of opportunity in education. As established in the previous chapter, public schools have fewer material resources than private schools. The opportunities for a poorer student become even more limited when attending a poorly resourced public school.

Chapter 6

Discussion

I have examined the availability and the distribution of material, human, and curricular school resources in the Arab countries at the international, regional, and country levels using nationally representative achievement data from TIMSS 2007. I also looked within the Arab countries to determine how these educational resources were distributed across different types of student populations: boys and girls, students from higher socioeconomic backgrounds and students from lower socioeconomic backgrounds, and public and private school students. Based on the observed differences, I examined the public and private gap in two countries in terms of student and school characteristics.

Several key findings emerged from the results presented in the previous two sections. The first set of findings showed that Arab eighth graders generally have lower levels of material, human, and curricular resources available in their schools when compared to their counterparts in the OECD countries. Inequality in the distribution of the resources is also higher in the Arab region than in the OECD countries. However, when compared to a group of low performing, low to middle income countries, the Arab region fares better in terms of availability and distribution of resources. Second, within the region, eighth graders in the richer Gulf countries do not necessarily attend schools that are better-resourced than their Mashrek counterparts. They have slightly more adequate budgets, smaller class sizes, more computers available, and are likely to have teachers that are certified and slightly better educated. However, there was no consistent pattern of greater inequality in either the Gulf or the Mashrek; it depended on the resource.

Cross-nationally, countries that stood out for consistently having the lowest levels of resources and highest inequality included Saudi Arabia in the Gulf and Syria in the Mashrek.

From the within-country resource comparison, girls in the Arab region outperformed boys in most countries, with the exception of Syria and Lebanon, two Mashrek countries. Gender differences in resources were not pronounced, as boys and girls had roughly equal access to resources (with some exceptions). Educational resource differences in material resources specifically were more evident when looking within countries by high and low SES groups, and by sector, with public school students at a disadvantage. The next sections will discuss resource, gender, and sector differences in detail.

6.1 Resource differences

These findings did not intend to show how varying levels of a resource is related to achievement, nor do they show how these resources are being used for learning and instruction, both of which are important for understanding Arab underachievement. The findings showed that among the world regions, the Arab schools had fewer material resources than the OECD countries. Given the low achievement of the region, this finding is unsurprising. When disaggregated by region, however, the Gulf often had lower resource indicators, implying that the richer nations do not necessarily resource their schools better. On the one hand, lower resources are to be expected, based on the lower achievement, but based on the wealth of the oil-rich countries, the under-resourcing of and inequality among schools is worrisome. Increasing resources will not necessarily lead to improved educational outcomes; however, achievement is so low that perhaps existing resources are not being used effectively, or the levels of resources have not yet reached the point of diminishing returns.

Somewhat surprisingly, given the level of achievement, Arab countries do relatively well in providing students with teachers that have desirable characteristics, such as years of experience, college education, a major in the field taught, and certification. Given the importance of teachers in the process of schooling, it was surprising that human resources—teacher characteristics—often matched OECD levels. While there are differing effects of each characteristic on achievement, the results suggest that there may be intrinsic differences between the Arab region and the OECD and within the region in the quality of teacher education, requirements for certification, and professional development opportunities. In fact, teacher education has been the subject of another large international study that surveyed 22,000 future teachers in 17 countries[14]. Initial reports from this study found that the differences between top and bottom scoring countries were very large (Michigan State University, 2012). Additional research is needed to determine how teacher education in the Arab countries compares globally. One effort in this area by Chapman and Miric (2009) examines the paradox of teachers in the MENA region who tend to be "relatively well trained, well paid (compared to other jobs), enjoy high levels of job security, and have moderately good student-teacher ratios" (312) yet achievement lags behind. Using document review and interviews with key policymakers and education development experts, the authors conclude that education ministries should develop better teacher preparation programs, find ways to better utilize the teaching force and engage parents and communities. Other research on the effects of teacher experience suggests that teachers with more than 15 years of teaching experience may confer additional benefits to students (Rice 2003). Several Arab countries approach this average of 15 years—Qatar,

[14] The Teacher and Education and Development Study in Mathematics (TEDS-M) conducted in 2008 represents the first effort to collect this kind of data internationally; only one Arab country (Oman) participated in the study, and final reports are still forthcoming.

Lebanon, and Egypt, for example—yet, there is no evidence that countries with higher average levels of teacher experience perform better (with the exception of Lebanon). Given the high levels unemployment in the region, it is likely that teachers remain at their jobs for longer due to the security and benefits that come with teaching. Whether the practices of more experienced teachers differ from those with less experience is a subject for future studies.

Class size presents another paradox, where in many of the Gulf countries, the average class size is around 30, and classes are smaller than the Mashrek average—Palestine, Egypt, and Jordan, for example, have class sizes approaching 40 students. Whether smaller classes are a result of intentional policy decisions is unknown. Regardless, theory suggests that smaller class sizes are better for low-achievers. But the purported advantages of smaller class sizes were not evident in the achievement of these Gulf countries. Findings from Chapman and Miric corroborate this idea, as they also note that "MENA countries have failed to seize the advantages that lower class size is presumed to offer. Instructional practice has not improved, nor has student learning increased despite the potential of smaller class sizes to enable individualized instruction" (Chapman and Miric, 2009, 320). For the Mashrek countries, however, significantly larger class sizes likely pose a source of strain for teachers and students, and point to a deficiency in resources.

The case of instructional time presents another puzzle because most countries, with the exception of Kuwait, seem to fall within global norms of time. As noted by Abadzi (2009), loss of instructional time is common, and the actual time is often different from the officially reported time. Observational studies would add much to our understanding of how instructional time is used in Arab schools. Certainly, places like Bahrain, Egypt, Syria, Lebanon, and the Palestinian

territories which have witnessed varying degrees of widespread violence in recent years, school closings, interruptions, and consequent loss of instructional time warrant attention.

Another area in which the Gulf countries specifically seem to be doing relatively well is in equipping schools with technology in the form of computers. Whether they are good quality, whether teachers are trained to use them for instruction effectively is a separate issue. Nevertheless, their presence is a promising sign that efforts are being made to modernize schools. For example, in Jordan, a major comprehensive education reform project, involving several muti- and bilateral donors, has been underway, called 'Education Reform for a Knowledge Economy'. One of the widely touted components has been a partnership with Intel that promotes integration of into classrooms and trains teachers to use these tools. Undoubtedly, it is essential for youth to learn how to use technology effectively. But less clear is whether computers will be able to challenge and question students and push thinking the way a good teacher can. The initiative has also included the establishment of a teacher academy for the purpose of training teachers. The outcomes are yet to be seen, but the Jordan case is one to watch.

6.2 Gender differences

A commonly held view of women in the Middle East is that they are at a great disadvantage when compared to men in those countries, and when compared to women in the West. To some extent, this disadvantage is real. Countries that abide by Islamic law, for example, subject women to unfavorable arrangements in areas like marriage, divorce, and

inheritance[15]. Political participation of women is low across the region. Women's share of the labor force is the lowest of any region in the world economy (Moghadam, 2003), especially in the private sector (Assaad & Roudi-Fahimi, 2007). However, the status of women, like the status of education, differs greatly by region within the Arab countries. For example, women's mobility and independence in Saudi Arabia is severely restricted, while in Lebanon, women enjoy much more freedom. Even within countries, women are stratified by class, religion, education, and age.

Given this backdrop, the finding that girls outperform boys in eight out of ten countries in the Middle East and that they attend schools that are as well-resourced as boys' schools is promising, regardless of other types of disadvantages girls may face in or outside school. Whether the advantage persists through later years, and whether the rate of retention in school is different for girls than boys would be important to know, but are indeterminable using existing data. Assuming that the female achievement advantage does persist, however, and assuming that higher achievement is linked to future higher productivity, male underachievement combined with overrepresentation in the labor force points to a potential source of low productivity for the region's workers. Nevertheless, this pattern of a *reverse gender gap* is exceptional. In noting this unique aspect of girls' performance in the Middle East as compared to the US[16], Fryer and Levitt (2009) suggest that, given the large portion of single-sex schools in the region, mixed-gender classrooms are a necessary component for gender inequality to translate into poor female math

[15] While Islamic law is prevalent in some Arab countries and does contribute to the disadvantaging of women, some have argued that the reason Muslim women lag behind Western women in legal rights, mobility, autonomy has more to do with developmental issues, such as the extent of urbanization, industrialization, proletarianization, and politics than with religious and cultural factors (Moghadam 2003).

[16] Fryer and Levitt (2009) document and analyze the emergence of a substantial gender gap in mathematics using ECLS-K data. They note that girls in the US are losing ground in math in every region of the country, every racial group, all levels of the socio-economic distribution, every family structure, and in both public and private schools.

performance. The effects of single-sex schools on student outcomes in the region have not been studied and present a ripe opportunity for future research. The fact that gender explains little of the variation in achievement in the Arab countries also matches world patterns, where in most countries with moderate or high total inequality in educational outcomes, less than one-fifth of inequality stems from gender (World Bank, 2011). While the reverse gender gap is a positive indicator of girls' engagement in education, and mathematics in particular, it is important to keep in mind that the historical and political context of the Arab region still poses considerable challenges for girls in education and in other sectors (Al-Mahadin, 2004). The status of women in the region has been changing and will continue to change as fertility rates decline, and average levels of education increase. Current challenges for the region concerning gender gaps in education include creating pathways from educational institutions to the workforce so that the benefits of girls' education extend beyond the household. More attention needs to be paid to the reasons for boys' underachievement, and policies for raising their performance should be developed.

6.3 Sector Differences

The most consistent and largest differences in resources were determined by school sector in the Arab countries, and sector explained the largest proportion of variance in achievement when compared to gender and the individual SES measure. SES, a proxy for wealth, had a strong negative correlation with attending a public school. This finding of a private school advantage is expected based on a large body of international literature on public and private differences (for a review, see Chakrabarti and Petersen, 2008 and Petersen and Llaudet, 2005), but the disparities in sector have received very little attention in discussion of Arab education. The large inequalities in sector match world patterns that differences in wealth

account for most educational inequality—"poverty rather than gender feeds overall educational inequalities in most of the world" (World Bank 2011). Policy, therefore, should direct redistributive efforts to poverty.

In oil-rich Bahrain, the redistributive mechanisms are relatively stronger, and as such, the finding that educational inequalities are as prevalent as they are should be a warning to policymakers. In Lebanon, the private school is a ubiquitous feature of the Lebanese school system. The privatization of schools in Lebanon is not driven by neo-classical economic theories that promote free markets as the most efficient way of providing a product or service to the customer. Rather, private schools are driven by mostly religious communities' insistence on providing their own education, a freedom guaranteed to them when the Lebanese state was established. In Lebanon, 56 percent of all students attend private schools, 3 percent attend free private schools, and 41 percent attend public schools. Most students (75%) in Beirut and the surrounding areas attend private schools. In contrast, in the more remote Northern Lebanon, 60 percent of attend public schools (Central Administration for Statistics, 2007). Northern Lebanon also has the highest poverty, unemployment, and illiteracy rates. Unsurprisingly, the poor children in that region are the most disadvantaged, with only one third of them enrolled in intermediate (middle) schools (Laithy, Abu-Ismail, and Hamdan, 2007). The persistence of inequities in educational attainment at the intermediate and higher levels highlights the need for more effective public intervention to improve educational outcomes for poor students.

Historical evidence may shed led on the emergence and persistence of public-private disparities, even as state involvement and commitment to public education has increased over the years. In particular, three episodes in the recent and distant past exemplify the long-standing gap between the public and private sectors. During the earliest days of the growth of Islam, the

acquisition of religious learning became a major facet of Islamic life, especially in the urban hubs, Baghdad, Cairo, and Damascus. Both the state and private providers offered services to this effect. While the state supported higher levels of (religious) education during this period, education at the lower level remained a private concern for parents (Tibawi, 1972). The practice of parental contributions to education was common, and remained that way. Much later, in the early nineteenth century, the region witnessed its first attempt to establish a public system. Muhammad Ali, Egypt's ruler at the time, wanted to create an army on European lines. In attempting to create this army, he established new institutions for modern, technical subjects such as arithmetic, geometry, trigonometry, geodesy, and military subjects. To recruit students into this system, Ali established elementary schools, and used material incentives such as free clothing, food, and monetary allowances. However, when parents were reluctant to enroll their children for fear of conscription, they were recruited by force. The shortcomings of this first "public" system were serious. The new schools were geared to serve a military machine, and none of them was for the purely intellectual or professional training of young Egyptians Females were completely excluded. And because this "modern" system operated as a rival or substitute for the traditional religious schools, it deepened cleavages within Egyptian society (Szyliowicz, 1973; Faksh, 1980). Later, these would become even deeper with the arrival and establishment of foreign private schools. The third episode in the region's history was the colonial one, which had a large impact on educational inequality vis-à-vis the public and private sectors. The British presence in Egypt and Palestine, and the French presence in Syria and Lebanon, not to mention other foreign groups, established educational policies and schools that exacerbated class and regional differences. For example, the British mandated that instruction in Egyptian schools be in English, and the French did the same in Lebanon. French and English were not the native

languages of the Arabs. To learn the new language of instruction required additional resources that only the wealthy could afford. The British in Egypt also decided to charge fees for basic levels of education, effectively disadvantaging the poor. Both the British and French colonial powers failed to support the nascent (Ottoman) state systems that had existed, opting instead to establish and operate new systems, exacerbating religious and social divides. These collective, historical, regional experiences in state-sponsored and private education have contributed to the educational and social inequalities that afflict societies in the Middle East today.

Bahrain and Lebanon represent two cases—it is likely that other countries in the region exhibit similar patterns of sectoral differences. The differences are likely to be larger in larger countries, like Egypt and Saudi Arabia. Another common source of inequality not captured in the TIMSS data but also stemming from privatization is through private tutoring, which is rampant in Egypt, where about 90 percent of teachers tutor privately, and is spreading across the region (Chapman and Miric, 2009).

6.4. Implications for research and for policy

Based on this study, areas ripe for future research around Arab education include teacher education and preparation. As I showed earlier, students have teachers with desirable characteristics, but the outcomes are inadequate. Qualitative and quantitative inquiries into why this may be the case would enhance our understanding of low achievement in the region. These inquiries can be conducted on a regional scale, and recommendations stemming from those can be implemented jointly as well. Collaboration among Arab countries in education has been common for curriculum design, but given the close proximity of the countries to each other, culturally and geographically, the benefits for shared centers and resources for teacher training

would be great. This study also showed that there are considerable differences between the regions in the Middle East, and as such, future research on education in the Arab region should disaggregate these regions in order to bring to light sub-regional issues that are masked when the region is discussed in its entirety.

The findings of the study suggest several areas where policy interventions could make differences. Because much of the variance is between schools, it seems more appropriate to emphasize interventions at the school level. Based on the finding that showed large sectoral differences, public schools that enroll a high proportion of low SES students should receive additional government support and attention, whether financial or technical. Policies and programs that focus specifically on improving outcomes for the poorest children should be given top priority. However, as business and corporate interests begin to influence education, calls for increased privatization of the education sector have become common. If they move in this direction, countries with small private systems at present must consider the effect of segregation on not just student achievement but also on social cohesion. Unless there are mandated quotas to ensure that students from diverse SES backgrounds are proportionally represented in all schools, inequality is likely to increase in these countries.

The reverse gender gap is another emergent issue that research and policy interventions can jointly address. Research should first establish whether boys are underachieving in all subjects equally, whether the disadvantage persists, and policies to combat boys' disengagement can then be enacted. The gender segregated school systems are more expensive to run and perhaps it is too early at this point for the conservative nations to consider co-education. Nevertheless, cost-benefit analyses could show whether co-education is a viable option in countries where single-sex education is the norm and resources are stretched.

Leaders in the Arab nations are not oblivious to the educational challenges, and reforms in the region have been frequent. There has been significant movement at the global level towards improving Arab education, involving multilateral and bilateral donors. For example, through the World Bank's Arab World Initiative, the Arab Regional Agenda on Improving Education Quality (ARAIEQ) was formally established in 2011 and has already produced an inclusive agenda for quality of education in the region. At the country level, many nations have recently undertaken ambitious project. Qatar, for example, is investing massive amounts in education on an epic scale in basic and higher education. Cynics expect only "air-brushed philanthropy and gold-plated business school sponsorships" (Coughlan, 2012). Birdsall et al. suggest that these types of efforts are attempts to assuage the population, and that quality will remain poor, and inequality will persist. Indeed, the major reforms have all been top-down, with limited input from citizens. One of the hallmarks of an educated society is that it holds government accountable, questions decisions, and demands evidence. The authoritative regimes in the region allow little space for questioning, and in this environment, it is not difficult to imagine how schools and even classrooms are run similarly. Possibly, an unspoken fear of the promotion of questioning will lead to citizens questioning the legitimacy of their rulers –a trend that has become evident in the recent revolutions. While some amount of skepticism towards these grand educational initiatives is healthy, it is difficult to deny that these endeavors are promising, and that some change is inevitable. Two questions emerge in regards to this change. The first is how long it will take before we can expect to see evidence of improved educational outcomes, not only in the form of achievement scores, but also in changes in attitudes, entrepreneurship, and problem-solving capabilities. The second is who will benefit most from these changes, and whether those benefits will be distributed equally among groups.

6.5. Limitations

The resource, gender, and sectoral differences documented existed at one point in time, and there is no way of knowing whether they persist throughout the years of schooling. In terms of the sectoral differences, without further information, such as measures of prior achievement, there is no way to determine how patterns of self-selection may have affected the estimates presented. Longitudinal test-score information on a national sample of high school students would be ideal in this case, but unfortunately, nations in the Arab region have not moved towards this goal. Although I attempted to provide an indicator of inequality among different groups, religion and ethnicity, two major sources of inequality, were entirely absent. In almost every country in the region, minorities, and sometimes majorities, have been systematically marginalized or discriminated against. As such, the picture provided of inequality provided is an incomplete one.

6.6. Future directions

The focus of the present study has been on resource differences by gender, SES, and school sector. In future studies, I plan to examine rural and urban differences in the region for Syria and Jordan, two Mashrek countries that have stratified according to this measure. In addition, I will explore resource differences by refugee status in Jordan and Palestine, which have a sizeable number of schools run by the United Nations Relief and Works Agency specifically for refugees. Another possible direction for future study, separate from the current one, is to determine how single-sex schools, a common feature of Arab schools, compare to co-educational schools, and whether single-sex schools confer any benefits on student attitudes and

outcomes as suggested by the idea that the observed reverse gender gap may be due to the segregation of boys and girls.

Further, as the next cycle of TIMSS 2011 is released, I plan to examine whether and how resource differences have changed over time. Regional events would suggest that the revolutions and general upheaval observed in places like Egypt, Tunisia, Syria, and Bahrain were triggered by awareness, gradual or sudden, of the inequalities in opportunities for social mobility. Whether the growth or exacerbation of these inequalities can be detected in educational resources is a question to be tested. Providing a description of the use of resources is a necessary step in understanding the Arab achievement crisis, as some have referred to it (Chapman & Miric, 2009). In several works, Hanushek (1997, 2003) and Hanushek and Luque (2003) have argued that education policies that are based on increasing inputs to schools have failed because the current organization and incentives of schools—detached from student performance—do little to ensure that any added resources will be used effectively. As such, studies of the use of resources are necessary—for example, how do teachers use their time? Are there marked differences among and within countries? Can these practices be linked to achievement? These issues can also be addressed in future studies with data from TIMSS.

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Appendix A. A summary of selected qualitative characteristics for Arab countries included in analysis

Country	Religions	Languages	Government	Independence	Notes on Economy
Egypt	Muslim (mostly Sunni) 90%, Coptic 9%, other Christian 1%	Arabic (official), English and French widely understood by educated classes	republic	1922 from the UK	was highly centralized, but has opened up considerably. economic reforms to attract foreign investment and facilitate GDP growth. export-oriented sectors include manufacturing and tourism, and Suez Canal revenues. Despite high levels of economic growth over the past few years, living conditions for the average Egyptian remain poor.
Jordan	Sunni Muslim 92%, Christian 6% (majority Greek Orthodox, but some Greek and Roman Catholics, Syrian Orthodox, Coptic Orthodox, Armenian Orthodox, and Protestant denominations), other 2% (several small Shia Muslim and Druze populations)	Arabic (official), English widely understood among upper and middle classes	constitutional monarchy	1946 (from League of Nations mandate under British administration)	among the smallest in the Middle East, with insufficient supplies of water, oil, and other natural resources, underlying the government's heavy reliance on foreign assistance. Other economic challenges for the government include chronic high rates of poverty, unemployment, inflation, and a large budget deficit
Lebanon	Muslim 59.7% (Shia, Sunni, Druze, Isma'ilite, Alawite or Nusayri), Christian 39% (Maronite Catholic, Greek Orthodox, Melkite Catholic, Armenian Orthodox, Syrian Catholic, Armenian Catholic, Syrian Orthodox, Roman Catholic, Chaldean, Assyrian, Copt, Protestant), other 1.3%	Arabic (official), French, English, Armenian	republic	1943 (from League of Nations mandate under French administration)	free-market economy and a strong laissez-faire commercial tradition. The government does not restrict foreign investment; however, the investment climate suffers from red tape, corruption, arbitrary licensing decisions, high taxes, tariffs, and fees, archaic legislation, and weak intellectual property rights. The Lebanese economy is service-oriented; main growth sectors include banking and tourism.

Palestine (Gaza & West Bank)	Muslim (predominantly Sunni) 99.3%, Christian 0.7%	Arabic, Hebrew (spoken by many Palestinians), English (widely understood)	semi-presidential multi-party republic	Current status subject to the Israeli-Palestinian Interim agreement; permanent status to be determined through further negotiation.	High population density, limited land and sea access, continuing isolation, and strict internal and external security controls have degraded economic conditions in the Gaza Strip. inflows of donor assistance, the PA's implementation of economic reforms, improved security, and the easing of movement and access restrictions by the Israeli Government. overall standard-of-living measures remain poor. The almost decade-long downturn has been largely a result of Israeli closure policies - a steady increase in Israeli-imposed movement and access restrictions across the West Bank in response to security concerns in Israel
Syria	Sunni Muslim 74%, other Muslim (includes Alawite, Druze) 16%, Christian (various denominations) 10%, Jewish (tiny communities in Damascus, Al Qamishli, and Aleppo)	Arabic (official); Kurdish, Armenian, Aramaic, Circassian widely understood; French, English somewhat understood	republic under an authoritarian military-dominated regime	1946 (from League of Nations mandate under French administration)	remains highly controlled by the government. Long-run economic constraints include declining oil production, high unemployment, rising budget deficits, and increasing pressure on water supplies caused by heavy use in agriculture, rapid population growth, industrial expansion, and water pollution. implemented modest economic reforms in the past few years, including cutting lending interest rates, opening private banks, consolidating all of the multiple exchange rates, raising prices on some subsidized items.
Bahrain	Muslim (Shia and Sunni) 81.2%, Christian 9%, other 9.8% (2001 census)	Arabic, English, Farsi, Urdu	constitutional monarchy	1971 (from the UK)	depends heavily on oil. Petroleum production and refining account for more than 60% of Bahrain's export receipts, 70% of government revenues, and 11% of GDP. Other major economic activities are production of aluminum, finance, and construction.
Kuwait	Muslim 85% (Sunni 70%, Shia 30%), other (includes Christian, Hindu, Parsi) 15%	Arabic (official), English widely spoken	constitutional emirate[17]	1961 (from the UK)	wealthy, relatively open economy with self-reported crude oil reserves of about 102 billion barrels - about 9% of world reserves. Petroleum accounts for nearly half of GDP, 95% of export revenues, and 95% of government income.

[17] An emirate is similar to a monarchy or sultanate, but a government in which the supreme power is in the hands of an emir (the ruler of a Muslim state).

Oman	Ibadhi Muslim 75%, other (includes Sunni Muslim, Shia Muslim, Hindu) 25%	Arabic (official), English, Baluchi, Urdu, Indian dialects	monarchy	1650 (expulsion of the Portuguese) dependence on British political and military advisors increased, but it never became a British colony	middle-income economy that is heavily dependent on dwindling oil resources. Because of declining reserves, Muscat has actively pursued a development plan that focuses on diversification, industrialization, and privatization, with the objective of reducing the oil sector's contribution to GDP to 9% by 2020. Tourism and gas-based industries are key components of the government's diversification strategy
Qatar	Muslim 77.5%, Christian 8.5%, other 14% (2004 census)	Arabic (official), English commonly used as a second language	emirate	1971 (from the UK)	second highest per-capita income country and the world's second fastest growing. Proved oil reserves of 15 billion barrels should enable continued output at current levels for 37 years. Qatar's proved reserves of natural gas exceed 25 trillion cubic meters, about 14% of the world total and third largest in the world.
Saudi Arabia	Muslim 100%	Arabic	monarchy	1932 (unification of the kingdom)	a leading producer of oil and natural gas and holds more than 20% of the world's proven oil reserves. The government continues to pursue economic reform and diversification, focusing on power generation, telecommunications, natural gas exploration, and petrochemical sectors. Almost 6 million foreign workers play an important role in the Saudi economy, particularly in the oil and service sectors.

Source: *The World Factbook 2009*. Washington, DC: Central Intelligence Agency, 2009.

Appendix B. A summary of selected quantitative characteristics for Arab countries included in analysis

Country	Population Size (in Millions)	Area of Country (Square Kilometers)	Population Density (People per Square Kilometer)	Urban Population (% of Total)	Life Expectancy at Birth (Years)	Infant Mortality Rate (per 1,000 Live Births)	Gross National Income per Capita (in US Dollars)	GNI per Capita (Purchasing Power Parity)	Public Expenditure on Education (% of GDP)	Net Enrollment Ratio in Education (% of Group) Primary	Net Enrollment Ratio in Education (% of Group) Secondary	Primary Pupil-Teacher Ratio
Egypt	74.2	995,500	75	43	71	29	1360	4940	–	94	83	26
Jordan	5.5	88,200	63	83	72	21	2650	4820	–	91	79	20
Lebanon	4.1	10,200	396	87	72	26	5580	9600	3	82	73	14
Palestine	3.9	6,000	648	57	72	29	1374	–	11	80	95	25
Syria	19.4	183,800	106	51	74	12	1560	4110	–	92	63	–
Bahrain	0.7	700	1041	97	76	9	19350	34310	–	96	90	–
Kuwait	2.6	17,800	146	98	78	10	30630	48310	4	83	–	10
Oman	2.5	309,500	8	72	76	10	11120	19740	5	74	77	14
Qatar	0.8	11,000	75	96	76	18	–	–	2	96	90	11
Saudi Arabia	23.7	2,000,000	12	81	73	21	13980	22300	7	93	60	15

Appendix C. Percentage of missing values by school resource and Arab country

	instructional resource	infrastructure	budget for supplies	computers	computers per student	class size	teacher experience	teacher education	math major	math education major	professional development	certified	weekly time	yearly time	percent on math	percent taught TIMSS
Bahrain	1.44	1.78	0.00	7.23	8.61	8.60	8.11	0.00	1.41	2.02	0.00	2.91	16.44	38.80	20.59	6.79
Palestinian National Authority	2.61	0.00	0.00	2.68	5.32	3.82	7.57	0.00	2.92	2.06	0.00	3.80	2.58	17.94	4.37	0.72
Jordan	4.48	0.84	0.00	0.00	1.10	3.51	7.74	0.00	0.00	0.00	0.00	3.04	0.00	0.00	6.74	0.00
Kuwait	6.38	6.37	4.15	25.44	26.11	14.11	11.47	0.00	2.93	0.00	0.00	4.97	8.75	47.23	26.78	1.25
Lebanon	10.80	6.34	3.07	6.88	10.53	9.52	12.87	0.00	2.90	2.42	0.00	5.56	23.27	49.52	48.34	1.51
Oman	6.64	0.00	0.00	20.46	22.12	0.45	4.50	0.00	1.59	0.51	0.00	1.59	3.56	32.96	8.83	0.00
Qatar	5.50	5.76	1.95	8.61	20.00	11.80	9.08	0.00	1.47	0.86	0.00	2.26	10.93	41.16	33.64	6.34
Saudi Arabia	12.72	5.61	4.36	45.52	46.35	6.24	5.96	0.00	8.68	1.11	0.00	100.00	8.52	42.13	21.36	0.00
Syria, Arab Republic of	6.87	3.50	0.85	1.87	2.63	1.71	3.61	0.00	3.25	4.04	0.00	0.84	0.87	21.35	5.67	0.00
Egypt	3.25	2.21	0.81	1.20	1.93	1.68	7.08	0.00	3.58	1.42	0.00	11.55	4.10	29.34	12.69	0.00

VITA
Samira Halabi

EDUCATION

2012 (expected)	Ph.D., Pennsylvania State University Major areas: Educational Theory and Policy; Comparative and International Education
2007	M.Ed., Vanderbilt University Major area: International Education Policy and Management
2003	Bachelor of Business Administration & Diploma in Educational Leadership, American University of Beirut. *With High Distinction*

PROFESSIONAL EXPERIENCE

- 1/2011-5/2012 **Project Coordinator**, Penn State University**.**
- 8/2007-8/2011 **Graduate Research Assistant**, Penn State University
- 8/2009-6/2011 **Managing Editor** for *Comparative Education Review*
- 11/2006-5/2007 **Asia Strategy Committee Coordinator**, Vanderbilt International Office
- 8/2004- 8/2005 **Program Manager**, American Lebanese Language Center, Beirut, Lebanon
- 8/2003-8/2005 **Instructor**, American Lebanese Language Center, Beirut, Lebanon

GRANTS AND AWARDS

2010	College of Education Dissertation Research Grant, Penn State University
2008, 2009	CIED Summer Research Grant, Penn State University
2005-2007	Fulbright Scholarship

SELECTED PUBLICATIONS AND PRESENTATIONS

Halabi, **S**., Smith, W., Collins, J., Baker, D.P., and Bedford, J. (2012). A document analysis of HIV/AIDS education interventions in Ghana. *Health Education Journal*. DOI: 10.1177/0017896912450248

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Halabi, S. Quality and Inequality in Arab education: A study of educational disparities in ten Arab countries using TIMSS 2007. Presentation at 55th Annual Conference of the Comparative and International Education Society (CIES), Montreal.

Halabi, S., Salinas, D. The Changing Faces of Math: A Historical Analysis of Images in Elementary Mathematics Textbooks. Presentation at 2011 American Education Research Association, New Orleans.