DETERMINANTS OF EDUCATIONAL ATTAINMENT IN EGYPT AND MENA: A MICROECONOMETRIC APPROACH

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Abstract

Using TIMSS data set on MENA countries, this study examines the determinants of educational outcome and gender inequality of learning in eight selected countries. The complicated structure of the data has been considered carefully during all the stages of the analysis employing plausible values and jackknife standard error technique to accommodate the measurement error of the dependant variable and the clustering of students in classes and schools.

The education production functions provide broad evidence from mean and quantile analysis of very low returns to schooling; few school variables are significant and none have effects across countries and quantiles. In general, student characteristics were far more important than school factors in explaining test scores, but there was considerable variability across countries in which specific factors were significant. Strikingly, computer usage was found to influence students' performance negatively in six MENA countries. Only Turkey and Iran had a significant positive effect of computer usage on maths achievements.

Gender inequality of academic achievement has been investigated thoroughly using mean and quantile decomposition analysis. There is mixed picture of gender inequality across the eight countries with three pro-boys, three pro-girls and two gender-neutral. This exercise gives no general pattern of gender inequality across MENA. A detailed analysis of Egyptian students' achievements explains the differential gap between school types, notably being single or mixed sex and Arabic or language schools. Single-sex schools perform better than mixed schools especially for girls. The single-sex language schools are more effective than the Arabic single sex school. This confirms the dominance of the language schools and is also related to the style and social-economic status of enrolled students.

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Dedication

To my wife, my children Mohamed and Maryam,

Also special dedication to my grandma, and my family

I also dedicate this thesis to the brave youth of

the 25th of January revolution in Egypt.

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Chapter 1

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

This thesis investigates the determinants of education achievement in Middle East and North Africa countries with special focus on Egypt. The determinants of education achievement are key factors affecting the quality of education and hence the human capital capacity in the developing countries. This thesis investigates the main determinants of education analysing both the role of family background and of school factors on students' performance. It also addresses the inequalities in the distribution of education achievement due to differences in performance between boys and girls. This introductory chapter lays out the motivation and the context for studying the quality of education.

Building a developed economy requires a high rate of economic growth, which in part depends on improvements in productivity and better education is likely to lead to higher productivity. The new growth models introduce human capital as a vital driving force to growth. Economic growth - improvements in a society's overall standards of living - and economic development have been studied by economists since Adam Smith. Economists are particularly concerned with analysis of sources of economic growth and divergence and convergence between developed and developing countries. Theodore W. Schultz (1961) claimed that human capital, "knowledge, information, ideas, skills, and health of individuals", is the major explanation behind these differences. Although the concept of human capital originated in the 1950s, and its development is associated with the work of Mincer (1958) and Becker (1965), relevant concerns were evident in the nineteenth century. Concern initially focused on the role of workers at the industrial revolution in the United Kingdom, and then other industrial countries, in terms of work division and specialization and learning by doing. However, the human capital concept of modern neoclassical economics dates to the late 1950s: Jacob Mincer's article "Investment in human capital and personal income distribution" in 1958 and Gary

Becker's book "*Human Capital"* in 1964. Human capital in this view is similar to physical capital. Investment in building human capital by education, training and health will lead to higher productivity. Individual success as well as countries economic development mainly depends on how much they invest on building capabilities efficiently and comprehensively (Becker 1994).

Human capital played a role in the rapid growth of Asian countries (Japan, Hong Kong, Taiwan, and South Korea since the 1960s), even if less important than physical capital accumulation. However, the early literature on human capital did not formulate a relationship between development and human capital investment; endogenous growth models have done this (Barro 1991; Lucas 1988).

The role of human capital in economic growth implies that policies toward building capabilities of humans through investment in education, health, and other fields are important for their influence on economic growth and on income distribution. Families choose to invest in human capital of their children expecting high returns in the future. International organizations argue that investment in education is a policy priority (Becker 1995). However, evidence from the literature shows that governments need guidance on how to improve educational outcomes (Glewwe 2002). Schools are not the only way to ensure growth, but play a large role in building human capital.

Economic research on school effectiveness and school quality emerged in developed countries much earlier than in developing countries. The focus of the early studies was on the quantity of education. Nonetheless, recent policy concerns revolve around quality issues (Hanushek 2005b). Hanushek and Kimko (2000) found a solid link between differences in education achievement and differences in economic growth. While researchers and policy makers stress the importance of education for economic growth, it is difficult to identify or quantify the impact (Glewwe and Kremer 2006); results suggest that what matters more than the quantity of education is the quality of that education. There are now numerous studies on quality of education and the factors influencing this for developed and developing countries, although few for Arab countries.

Riddell (2008) dates the start of school effectiveness research in developed countries to the Coleman Report for the United States. Coleman et.al (1966) used a production function approach to explore the input-output relationship between school resources and individual student achievements. The second wave of research, from the late 1980s, moved to investigate process variables (teachers, classroom practices) suggested by education theory. The most recent wave focuses on the hierarchical relationship among students, schools, classes, teachers, and different resources in different locations in each country. This suggests that qualitative measure of education and cognitive achievement tests are better than other quantitative measures such as literacy or enrolment rates as an indicator for future economic opportunities (Woessmann 2004).

Policy interventions to improve education can be derived by input – output analysis, especially those inputs perceived to be relevant for policy. Such information is important at the school management level as well as at the macro-policy level of finances, school integration and accountability. The concept of a production function can be introduced to model maximum achievable output for given inputs. Firms are seeking to maximize profits by taking rational decisions about the level of production and the mix of inputs, given product demand, input prices and the production function (Hanushek 1979). This represents the theoretical foundation to production function studies which has been extensively used to assess the determinants of education quality. Education production functions differ from standard firms' production functions because the maximand is output rather than profit, especially in the state sector, and the purpose of analysis is to identify determinants of educational outcomes.

1.2 Literature Review

The research on economics of education has examined many factors that have potentials of positive improve to the learning outcomes. School infrastructure, school organization, teachers' characteristics and preparation all have been under empirical investigation. There exists an extensive literature on the effects of home background and school resources (or school inputs) on student outcomes

(Ammermüller et al. 2005; Behrman et al. 1997; Behrman 1994; Fertig 2003; Glewwe 2002; Glewwe and Kremer 2006; Glewwe and Miguel 2007; Glewwe et al. 2011; Kingdon 1996; Krugger 2003; Rivkin et al. 2005; Woessmann 2004) and Hanushek (1995, 1998, 2003, 2005, 2006, 2007, 2008,2009), , b, b)all try to identify the characteristics that affect the performance of students and some consider which public policies could improve the quality of education.

Behrman (2010) conceives of education as the acquisition of knowledge and skills that increase productivity analysing the process from a development economics point of view. So education is an essential component in the development process. From this perspective education encompasses not only formal education but also any form of experience and knowledge gained through life. Inputs that increase productivity through acquiring knowledge and skills are the determinants of education in the educational production function.

One issue of particular concern for education policy is whether increasing school resources would have significant positive effects on student outcomes. Whether school inputs matter for educational and labour-market outcomes of students are an issue of great public policy concern. There are many outputs from education and many inputs to the production process, and this makes estimation of educational production functions complicated. Besides school resources, inputs related to family background and the local community are important. Education outputs could be split into: (1) student performance on cognitive tests (while in school), (2) educational attainment after school (most often measured by years of education) or (3) labour-market outcomes (particularly earnings) later in life. There is debate over whether school resources have significant effects on the three measures of output. We are more concerned on the first type of output in the developing countries in general and with a special focus on the Middle East and North Africa region.

Studies on the determinants of students achievements in developing countries are fewer in number than those on developed countries (Hanushek 1995). The first part of this review will focus on studies conducted in developing countries using education production functions. The second part of the review will highlight studies

incorporating the international school performance datasets in MENA, Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS).

Numerous reviews on school effectiveness have been published since the late nineties. Authors have published reviews on school effectiveness and education production functions across the world such as Fuller & Clarke (1994), Hanushek (1995), Scheerens (2000; 2007) and Glewwe (2002). Studies carried out in developing countries show that resource input variables have considerably more impact than is commonly found in developed countries (Hanushek 1995; Scheerens 2000). Nonetheless, these studies have been criticized for methodological and sample selection bias issues (Glewwe, (2002).

Recently, Glewwe et al.(2011) review the past 20 years research on economics of education focused on production function and resources allocation in developing countries. They considered 79 studies which met their criteria of empirical quality and address the area of the review. The impact of school and teacher variables impact on students' learning seem to be ambiguous especially when they limit the study to the 43 high quality studies. The main impacts appear to come from having a fully functioning school, teachers with greater knowledge of the subject they teach, a longer school day, the provision of tutoring and lower teacher absence. It is clear from this review the limited number of high quality studies on developing countries. Randomized controlled trials (RCT) studies are too few to draw any general conclusion about any of the interesting variables in the review. Among those reviewed studies none targeted MENA countries except for two on Turkey (Engin-Demir 2009; Kalender and Berberoglu 2009).

Engin-Demir (2009) uses part of dataset from a larger research project on "light work[1] and schooling" to investigate the relative importance of selected family, individual and school related factors on student academic performance of Ankara urban poor primary schools. It is found that family background and school

[1] ''Light work'' is defined as work that does not interfere with schooling and it is not exploitative, harmful or hazardous to a child's development (International Labour Organization (ILO), 2002).

characteristics accounted for around 5% of the variation in student academic achievement. Student characteristics including gender, work status, well-being at school, grade and parental support found to explain 15% of variations in students performance in a weighted composite of maths, Turkish and science scores. Student-teacher ratio and teacher training have a strong effect on academic achievements. The other work cited (Kalender and Berberoglu 2009)focused on student activities in the class room which is beyond the scope of this study.

The emergence of international standardized tests of student performance enriched research on quality of education. The comparable cross country measures reveals significant differences in achievement for the same years of schooling. Studies incorporating TIMSS data are very useful to compare developing countries.

Using the TIMSS-R (1999) dataset, Howie (2003) investigated the importance of language in explaining variations in achievement in mathematics in South Africa (a proxy for ethnic heterogeneity). The main finding is that students who spoke English or Afrikaans at home scored significantly higher than those speaking African languages due to the heterogeneity of student home language and language of instruction at school. Student's perceptions of the importance of maths are significant as well. Rural areas are also found to perform worse than urban.

Woessmann (2003b) finds that international differences in student test scores (in maths and science), using TIMSS data, are caused not by differences in school resources, but are mainly due to differences in educational institutions. Woessmann (2005a) reported that in five high-performing East Asian economies, family background is a strong predictor of student performance in Korea and Singapore, while Hong Kong and Thailand achieve more equalized outcomes. School autonomy over salaries and regular homework assignments are related to higher student performance. There is no evidence that smaller classes improve student performance in East Asia. Similar results found in Eastern Europe countries during transition, student background accounted for the most part of academic achievement variations with differences across two groups of countries based on cultural differences (Ammermüller et al. 2005).

Comparative studies are very useful to gain insights on strengths and weaknesses of education systems. Ammermuller used PISA data to decompose the gap of maths test score between Germany and Finland. He employed Oaxaca-Blinder and Juhn, Murphy and Peirce (JMP) methods to investigate the mean and the distributional gap (Ammermueller 2007). The JMP residual imputation approach deals with residuals over quantiles to explain the aggregate gap. It does not provide a detailed decomposition and it is difficult to implement in general cases with conditionality on explanatory variables. It is found that German students and schools have on average more favourable characteristics, but experience much lower returns to these characteristics in terms of test scores than Finnish students. The role of school types being public or private, single sex or coeducation and domestic language or foreign language school remains ambiguous.

1.2.1 **Estimation problems of EPF and possible solutions**

Estimating education production functions faces a number of practical difficulties: omitted variable bias, sample selection bias, inaccurate data due to measurement errors, aggregation bias using inappropriate levels of analysis (using school level variables to explain student-level differences), endogeneity between school inputs and student performance, functional form e.g. linear, log linear, or additive, model specification and measuring the dependant variable (Kremer 1995; Todd and Wolpin 2003; Vignoles et al. 2000). "One approach toward addressing the problems of omitted variable, measurement error, and endogenous program placement is instrumental variables (IV)" (Glewwe and Kremer 2006:16). However, it is not easy to find good instruments (variables correlated with the observed variable but not correlated with the error term) and instrumental variables can only identify the effect for a sub-set of the total population (Vignoles et al. 2000).

Randomised trials and natural experiments have been utilised to overcome some of the methodological problems raised above. Randomized control trials (RCT) are conducted to compare a "treatment" group and a "control" group selected randomly from a number of observations with no systematic differences. Characteristics change in response to treatment (Hawthorne and John Henry effects)

and sample selection and attrition are serious problems facing random trials if not organized carefully (Glewwe 2002). Natural experiments on the other hand make use of any natural exogenous variation in school input level. The main benefit of research taking advantage of natural experiments if well implemented is that it introduces a new approach to estimate policy effects without additional assumptions (Todd and Wolpin 2003).

RCTs are not protected from criticism; they suffer from substantial problems due to their experimental nature. There are important lessons to be drawn from a systematic evaluation of production function estimates, while paying attention to the quantitative problems identified by Glewwe (2002).

The lack of data and limited financial resources devoted to research in the developing countries and the authoritarian regimes in MENA restrict the application of the above mentioned techniques. Therefore, the retrospective data drawn from the TIMSS 2007 round will be used here. The next chapter will introduce it.

1.2.2 **Inequality in education**

Inequalities and outcome differences between several groups could be in earnings, school attainment and other factors. Johnes (2006) argued that growth depends on initial income, the investment to GDP ratio, school enrolment rates, schooling quality, schooling distribution, openness, growth amongst trading partners, and a measure of political stability. The quantity, quality and distribution of educational (inequality and discrimination) attainment have an impact on social outcomes, such as child mortality, fertility, education of children and income distribution. Which factors of education system or home background characteristics are responsible for the different gender outcomes in academic achievements? And to what extent do gaps really refer to discrimination and educational distribution issues? There have been trials to measure and quantify the effect of educational attainment and distribution on economic and social outcomes (Barro and Lee 2010) but they mostly focused on the quantity of education not on quality.

Equal educational achievements for men and women have been regarded as one of the main drivers of economic and social development across the world different regions such as East Asia, Southeast Asia and Latin America. However, regions such as South Asia, West Asia, the MENA, and sub-Saharan Africa who did not invest enough in education of female have limited contributions of women in the economic and social progress (Schultz 2002).

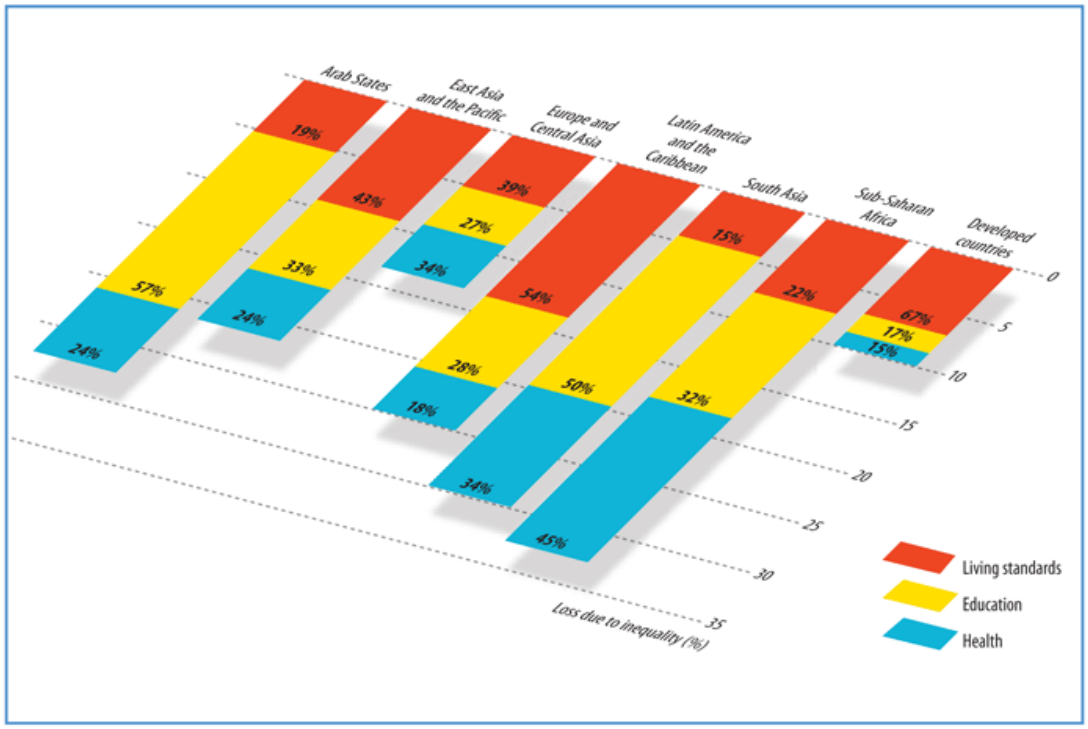
There is evidence, especially in South Asia, that discrimination against females in the labour force follows discrimination in education. Estimates of private wage returns to schooling in Pakistan indicate lower rates for women than men; but as the social benefits expected from educated women to the household is believed to be high, discrimination against female education could lead to slower economic growth in addition to having adverse social implications (Alderman et al. 1996; Alderman and King 1998). Allowing for the impact of female education on fertility and education of the next generation, girls have higher marginal (social) returns to education (Klasen and Lamanna 2009). Thus, discrimination against female education is socially costly and may be problem in MENA countries.

The thesis addresses one aspect of this, gender differentials in educational attainment, and considers implications for policy on education. There are several reasons to suggest gender inequality, such as different skill levels of boys and girls, different pace in acquisition of skills and different ages for the appearance of certain skills. This could lead to unequal treatment in school choice or fields of study at higher levels of education between boys and girls. Streaming based on girls' advantage in reading and literacy and boys' perceived advantage in maths can affect choice and success in subjects and earnings after graduation.

Another reason for skill differences is related to gender combination of teachers and students. Parental and social prejudices about field of study and future occupations affect educational choices and could affect the educational outcomes. While streaming could be postponed to later years to overcome the negative effects on boys and girls, prejudices and expectations are difficult to uncover in a formal framework (Münich et al. 2012).

Family background is a key source of inequality in education. Intergenerational association of some specific characteristics may give rise to some form of discrimination whether intended or unintended. Family status, social connection and parental investments in their children are a clear illustration of one of the discrimination mechanisms. A better educated family with good networks will advantage their children in a form that would not be possible for children from a disadvantaged background through high quality child care or better jobs. Capital market imperfections with credit constraints will lead to lack of financial resources to poor families' children. If a poor family wanted to send their talented child to a good university but they cannot borrow the money to finance it, it is a form of discrimination against the poor. Whenever such discriminations exist, a policy interaction in the education system that reduces or eliminates the effect of family background is a necessity (Münich et al. 2012).

Figure 1-1: Loss in the Human Development Index due to Inequality by regions



Note: Numbers inside bars are the percentage share of total losses due to inequality attributable to each HDI component.

Source: HDRO calculations using data from the HDRO database, Human Development Report, 2010

Human Development Report HDR (2010) present estimates of the total loss in human development due to multidimensional inequalities, the loss in health, Education and living standards and the effects of inequality on country HDI rank.

People in Sub-Saharan Africa suffer the largest HDI losses because of substantial inequality across all three dimensions, followed by South Asia and the Arab States (Figure 1-1). In other regions the losses are more directly attributable to inequality in a single dimension. Considerable losses in the Arab States can generally be traced to the unequal distribution of education. According to the report, Egypt and Morocco, for example, each lose 28 percent of their HDI largely because of inequality in education (Klugman and Programme 2010). Inequality in education accounts for the largest share (57%) of the 'losses' in HDI in Arab states. This suggests that reducing inequalities in education is a very important area for reform in MENA.

Gender inequalities in education have been an issue of concern for a number of decades. Initially, attention tended to focus on differences in enrolment rates but these have largely been eliminated with the achievement of universal primary education so attention has shifted to gender differences in the quality of education and completion rates for basic and secondary education (Hanushek and Woessmann 2008). Measuring school attainment by grades completed addresses an aspect of inequality but may not capture quality; gender differences could affect the quality of education received even if girls progress at the same pace or faster than boys in developing countries (Grant and Behrman 2010). The World Bank statistics on education indicate that with increasing completion rates for girls, the gender gap of grade completion dropped to four percent in 2005 in developing countries (EdStats 2008). This does not imply decreasing inequality in the quality of education, although it is clearly desirable.

Macdonald et al. (2010) investigate the relationship between wealth and gender inequality in cognitive skills in Latin America using PISA data. School characteristics appear to affect wealth inequality more than household characteristics, although there is only a weak association between school competency and wealth.

Tansel (2002) uses data from the household income and expenditure survey of Turkey in 1994 to examine the determinants of school attainment of boys and girls. Using ordered probit models, it is found that educational attainment is strongly

related to household income, parents' education, urban areas and self employed father where girls benefit more from higher income at the primary, middle and high school.

Using primary data from Jordan's capital city Amman as a representative for MENA, Nadereh et.al (2011) examines the determinants of female labour supply from the conservative societies' immigrants, such as countries from the Middle East and North Africa (MENA) region, in Europe. Their research focuses on the role of education, especially higher education, and social norms in MENA on the choice of women to work outside home. Though the region has achieved substantial progress in educating women, its Female Labour Force Participation (FLFP) remains the lowest among all regions. Employing a single equation probit model, they found that higher education (post- secondary/university/post-university) has a positive and significant impact on FLFP compared to secondary and below. Conversely, there is a strong negative association between traditional social norms and the participation of women in the labour force.

Dancer et.al (2007) use data on school enrolment from the 1997 Egypt Integrated Household Survey (EIHS) to investigate how the residence place being urban-rural interacts with child gender on the decision of investment in schooling. From a multinomial logistic model, it is found that urban boys are more likely to enrol in schools and have some schooling rather than females. Mother's education in rural areas has a strong positive impact on schooling decisions about girls. On the other hand, father's education affects positively the enrolment likelihood of both boys and girls. The Upper Egypt (south) residents are less likely to enrol to school nevertheless of their gender. The Upper rural Egypt population in general are disadvantaged in schooling enrolment. Despite its importance, the literature has no studies on educational production in Egypt. Studies on Egypt tried to explore the education problems in Egypt (Hanushek and Lavy, 1994; Hanushek et al, 2007; and Lloyd et al, 2001) however, their focus was on enrolment, dropouts, and linkages to quality.

The lack of evidence on inequality of schooling as an important factor for economic and social development in MENA requires a deeper analysis to give insights for the

policy makers. As has been discussed above, the literature is almost has very few studies including MENA countries. In addition, most of the studies whether on developed or developing countries consider the enrolment element of schooling. The analysis requires another important dimension to be considered, that is quality. Gender inequality can be clearly seen from some practices in the society such as exclusion or not sending girls to schools. Nonetheless, inequality could be more complex or hidden in some preferences and home practices that affect the educational achievement of those boys or girls in school.

The thesis is structured as follow; the second chapter introduces an overview of the TIMSS dataset used in this study, presents descriptive statistics on MENA selected countries education mainly from TIMSS in addition to other sources and discusses the characteristics of MENA region. The third chapter analyses in detail the determinants of education and school effects on the quality of education in Egypt. This chapter contribute to the debate of schools effects on learning outcomes by examining the school heterogeneity impact (Arabic vs. Language) on student performance and gender inequality. The fourth chapter investigates the determinants of education in MENA. Three models are employed for the cross-country analysis in addition to school fixed effects for the production function model. First, we estimate an educational production function for each country to examine the effect of school resources and family characteristics (SES) on test score achievements in maths and science. Second, Meta-analysis is employed to identify any factors that are significant across the set of countries. Third, quantile regressions are employed to assess if the influence of factors on attainment varies according to the level of attainment. The fifth chapter deals with gender inequality through decomposition analysis of learning outcomes in MENA. The decomposition analysis investigates the gap on average and across distribution by applying unconditional quantile proposed by Fortin et.al (2010) on the complex TIMSS data. The sixth chapter finishes with a concise conclusion drawing together the research.

Chapter 2

OVERVIEW OF THE DATA

This chapter discusses the TIMSS dataset used in this study and presents descriptive statistics on MENA selected countries education mainly from TIMSS in addition to other sources.

2.1 The TIMSS student performance data

The **Trends in International Mathematics and Science Study (TIMSS)** is a large scale cross country comprehensive dataset, first conducted in 1995 by the International Association for the Evaluation of Educational Achievement (IEA), an independent international cooperative of national research institutions and government agencies. Members of the IEA are top educational research institutions from participating countries in Africa, Asia, Australia, Europe, Middle East, North Africa, and the Americas. The aim of TIMSS is to provide internationally comparative assessment data on student performance with respect to a certain curricula for maths and science. It provides a rich array of information on achievement and the context in which learning occurs. TIMSS 2007 was conducted at the fourth and eighth grades in 59 participating countries and 8 benchmarking participants.

The TIMSS database provides individual student-level performance data in maths and science, with supporting information reported by student, teacher, and school principal for nationwide representative samples of students in each of the countries. TIMSS data set has some unique features compared to other international assessment programs (such as PISA[2]): it aims to assess the actual curriculum which is the focus of the school; TIMSS covers the common curricula in the majority of participating countries; TIMSS targeted population is a specific grade not age which

[2] The OECD Programme for International Student Assessment (PISA) is meant to assess how well students approaching the end of compulsory schooling are prepared to meet real-life challenges, rather than to master their curriculum.

might be better to assess the effectiveness of particular schooling policies; and TIMSS provides family and teacher background information.

2.2 TIMSS sample design

Each participating country followed a two-stage stratified cluster sample design. At the first stage a country randomly sampled the schools to be tested, then one or two classes were randomly chosen at the second stage from the specified grade and all students of that class were tested in both maths and science. This design yielded a representative sample of students within each country. Schools were excluded for many reasons such as being geographically remote, very small or for students with disability but exclusion rates of schools did not exceed 3% of the total school population. Students from selected schools were excluded if they could not take the exams in the test language or they have a disability. School stratification was employed in TIMSS to enhance the precession of the survey results. A minimum of 150 schools is required to meet the TIMSS sampling standards. All countries used measure of size (MOS) of the school as implicit stratification; however, other explicit and implicit stratifications were applied individually by each country.

Data for this study is from the achievement test booklets, the student questionnaires, the teacher questionnaire and the school questionnaire. Student achievement data are merged with background data from questionnaires for each individual student. TIMSS background data questionnaires include information about student and family background; such information is provided by the student about parents level of education, nationality, number of books at home, and information about student themselves such as sex and age. Maths and science teacher background questionnaire provide information about teacher characteristics such as gender, education, years of experience and teaching license. The school questionnaire, answered by school principal, provides information on the community location of the school, percentage of affluent or disadvantage students at school, class size and availability of school resources. Merging TIMSS data requires using the link files and sorting certain variables to get the right merger of all the data files without losing any information.

2.3 TIMSS analysis and complexity of the data

The TIMSS database is quite complex, in particular due to the multi-stage sample design and use of imputed scores (also known as plausible values). The stratified multi-stage sampling complicates the task of computing standard errors when using large scale survey data. Sampling weights can be used to obtain population estimates and re-sampling technique should be used to get unbiased estimates. TIMSS uses the jackknife repeated replication technique (JRR) , for its simplicity of computation, to estimate unbiased sample errors of estimates (Foy and Olson 2009).

The use of sampling weights is necessary for representative estimates. When responses are weighted the results for the total number of students represented by the individual student is assessed. Each assessed student's sampling weight should be the product of : (1) the inverse of the school's probability of selection, (2) an adjustment for school-level non-response, (3) the inverse of the classroom's probability of selection, and (4) an adjustment for student-level non-response (Williams et al. 2009).

2.3.1 **Computing Sampling variance using the JRR technique**

The estimation of the standard errors that are required in order to undertake the tests of significance is complicated by the complex sample and assessment designs which both generate error variance. Together they mandate a set of statistically complex procedures in order to estimate the correct standard errors. As a consequence, the estimated standard errors contain a sampling variance component estimated by Jackknife Repeated Replication (JRR).

The first step to compute the variance with replication is to calculate the estimate of interest from the full sample as well as each subsample or replication. The variation between the replication estimates and the full-sample estimate is then used to estimate the variance for the full sample. The formula to compute a *t* statistic from the sample of a country is:

$$\mathrm{Var}_{\mathrm{jrr}}\ (t) = \sum_{h=1}^{H} [\ t\ (J_h\ ) - t\ (S)\ ]^2 \qquad (2.1)$$

$$\textbf{s.e. (t)} = \sqrt{\mathbf{V(t)}} \qquad (2.2)$$

Where ***t(S)*** is the statistic of interest for the whole sample computed with the whole sampling weights, ***t(Jh)*** the corresponding statistic using the ***hth*** jackknife replication sample ***jh*** and the replication sampling weights and V is the Variance. The total number of replications is 75 (H=75). In the TIMSS 2007 analyses, 75 replicate weights were computed for each country regardless of the number of actual zones within the country. If a country had fewer than 75 zones, then the number of zones within the country was made equal to the overall sampling weight. Consequently, the computation of the JRR variance estimate for any statistic required the computation of the statistic up to 76 times, once to obtain the statistic for the full sample based on the overall weights and up to 75 times to obtain the statistics for each of the jackknife replicate samples.

In practice, weights of students in the ***hth*** zone are recoded to zero to be excluded from the replication and are multiplying by two the weights of the remaining students within the ***hth*** pair. Each sampled student was assigned a vector of 75 replicate sampling weights (Olson et al. 2008a). This will account for the part of the error related to the school clusters. The other part is related to the dependant variable measurement from using plausible values.

2.3.2 **Plausible Values (PVs)**

The TIMSS tests were designed so that each student answers just a subset of the mathematics and science items in the assessment rather than all questions. Each student was assigned only one booklet, such that a representative sample of students answered each item. Eighth grade students were allowed 90 minutes for this test. Approximately, for all maths and science, 47% of the items were in multiple-choice and 53% were constructed-responses. In multiple-choice, correct responses items were awarded one point each, while constructed-response items could have partial credits with fully correct answers being awarded two points.

Given the need to have student scores on the entire assessment for analysis purposes, TIMSS 2007 used Item Response Theory (IRT) scaling to summarize student achievement on the assessment and to provide accurate measures of trends from previous assessments. The TIMSS' IRT[3] scaling approach used multiple imputation—or "plausible values"—methodology to obtain proficiency scores in maths and science for all students (Foy and Olson 2009).

Plausible values represent the range of abilities that a student might reasonably have if he responded to all the items, given the student's item responses. Plausible values provide a general methodology that can be used in a systematic way for most population statistics of interest. Using standard statistical tools to estimate population characteristics, plausible values are also useful for the computation of standard errors estimates in large-scale surveys where the focus of interest is population parameters and not individual students (Wu 2005).

The plausible values methodology was employed in TIMSS 2007 to guarantee the accuracy of estimates of the proficiency distributions for the TIMSS' whole population and comparisons between subpopulations. Plausible values are not intended to be estimates of individual student scores, but rather are imputed scores for like students—students with similar response patterns and background characteristics in the sampled population—that may be used to estimate population characteristics correctly (Olson et al. 2008a: 231).

So each student in TIMSS 2007 has five plausible values for maths and science, as well for each of maths content (algebra, geometry, numbers, and data and chances) and science content (biology, chemistry, physics, earth science) and cognitive domains (knowing, applying and reasoning) for maths and science. To avoid the measurement error of using one plausible value or the average of them, each analysis should be replicated five times, using a different plausible value each time,

[3]"Three distinct IRT models, depending on item type and scoring procedure, were used in the analysis of the TIMSS 2007 assessment data. Each is a "latent variable" model that describes the probability that a student will respond in a specific way to an item in terms of the student's proficiency, which is an unobserved, or "latent", trait, and various characteristics (or "parameters") of the item"(Foy, Galia, and Li, TIMSS 2007 Technical Report :226) .

and the results combined into a single result that includes information on standard errors that incorporate both sampling and imputation error (Foy and Olson 2009).

To sum up, estimating the point estimate of a statistic from TIMSS with plausible values requires computation of the specific statistics for each plausible value and then taking the average of the 5 plausible values statistics:

$$\hat{\theta} = (1/5)\sum_{PV=1}^{5} \hat{\theta}_i \qquad (2.3)$$

The sampling variance is the sum of average sampling variance for the 5 plausible values and an imputation variance. The average sampling variance is computed by estimating the sampling variance associated with each plausible value and averaging them. The imputation variance is determined by estimating the variance of the five estimates of using the normal method of calculating the variance:

$$\text{Imputation variance} = (1/4)\sum_{PV=1}^{5} \left(\hat{\theta}_i - \hat{\theta}\right)^2 \qquad (2.4)$$

The sampling variance is then simply the average sampling variance across the 5 PV's plus 1.2 times the imputation variance. As before, the standard error is the square root of the sampling variance. Note that in working with plausible values, one cannot simply estimate the average of the 5 plausible values and use the resulting score as your dependent variable. This results in biased estimates of the standard errors of any calculated statistic (Willms and Smith 2005). For estimations involving TIMSS test scores, one must estimate the sampling variance for each of the PVs using the Jackknife as shown above.

2.4 MENA characteristics

The country context in which the data are collected is important to interpret the results. Salehi-Isfahani (2010) highlights some characteristics of MENA[4] economies which are related to human capital development: high income from natural

[4] The **MENA** Region, following World Bank classification, includes: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen and we added Turkey for its similarity to be a benchmark.

resources (oil) that is related to high individual consumption relative to low productivity, rapid growth of youth population accompanied by high rates of unemployment and low participation of women in labour market and low productivity of education though high investment in schooling.

MENA countries share many characteristics and differ in many aspects. They share religion, culture, geographical place, desert climate in most areas, language (with exceptions), history and poor education systems. Nonetheless, MENA has a high degree of heterogeneity especially in areas of human development such as health and education[5]. Studying MENA as a one region could be motivated by the similarities, but made possible and interesting by the heterogeneity of income and institutions.

MENA countries can be classified into three groups by their levels of per capita income. First, there are the high per capita income oil-rich countries of Bahrain, Kuwait, Oman, Qatar, United Arab Emirates, Saudi Arabia and Libya. Second, middle income countries are some large oil exporting countries (Algeria, Iran and Iraq) as well as Egypt, Syria, Jordan, Lebanon, Tunisia, Morocco, Palestine and Turkey. Third, the low income countries include Djibouti, Sudan and Yemen. The largest share of MENA's population falls in the middle income category with more than three quarters of the region's people.

The population size and incomes of the MENA countries are diverse but the majority of economies in the region are oil-based. Table 2.1 shows that in our TIMSS sample Saudi, Turkey, and Iran have higher GDP per capita followed by Algeria and Tunisia; with Egypt, Jordan and Syria having the lowest income. The variety of income levels provides one motivation to investigate education quality across these countries.

The populations of Egypt, Turkey and Iran each exceed 70 million compared to less than 20 million in each of Jordan, Syria, and Tunisia. Women represent less than one third of the labour market force in all countries. Public spending on education as a

[5] Some degree of variation in a sample is, of course, necessary for statistical estimation.

percentage of the GDP is below 7% at most (in Saudi Arabia this is below military expenditure).

Table 2.1: MENA selected indicators of 2007

Country	GDP per capita, PPP (constant 2005 international $)	GDP per capita, PPP (current international $)	GDP (constant 2000 US$) Millions	Population, total Millions	Female (% of total Labour force)	Military expenditure (% of GDP)	Public spending on education, total (% of GDP)
Algeria	7305.14	7764.58	73085	34	31.00	2.91	
Egypt	4955.16	5266.80	135869	77	23.93	2.50	3.68
Iran	10285.53	10932.41	151803	71	29.43	2.87	5.49
Jordan	4851.32	5156.43	13497	6	22.25	5.81	
Saudi Arabia	20242.88	21516.01	238834	26	15.53	9.21	6.39
Syria	4406.92	4684.08	26879	19	20.38	4.10	4.85
Tunisia	7101.99	7548.65	27118	10	26.50	1.38	7.06
Turkey	12488.23	13949.65	372619	70	25.96	2.17	

SOURCE: World Development indicators.

Table 2.2 indicates that MENA selected countries have very high primary net enrolment rates. The net enrolment for secondary education is not available in most of those countries. The gross enrolment ratios however reflect a better situation compared to other developing regions of the world according to the World Bank indicators.

Table 2.2: School Enrolment Ratios by Gender in Selected MENA Countries.

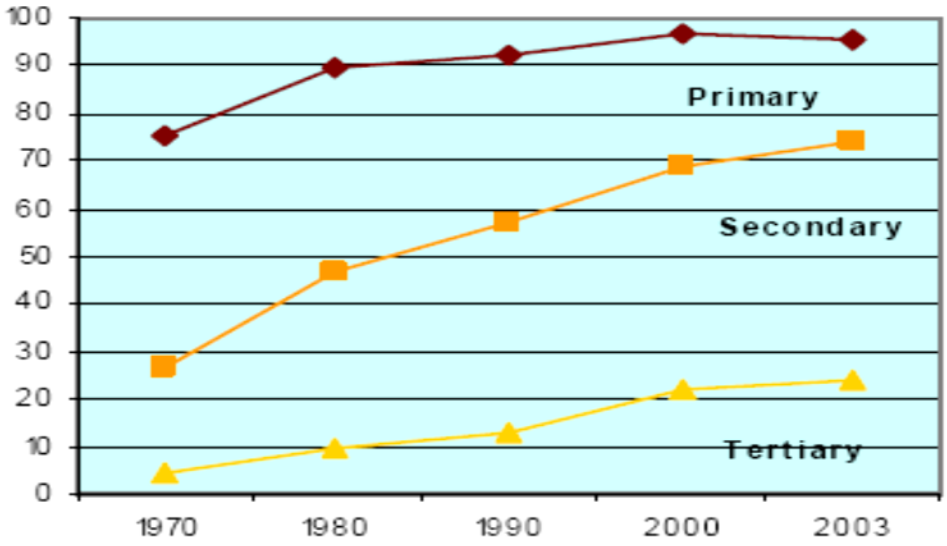
Country	School Enrolment 2007 (%net)						
	Primary				Secondary		
	Male	Female	Total	Private % of total	Total	Female	Male
Algeria	96.32	94.72	95.54	0.20			
Egypt	95.48	91.66	93.62	7.79			
Iran	99.09	99.90	99.48	5.24			
Jordan	88.26	90.00	89.11	32.57			
Saudi Arabia	84.82	84.15	84.49	8.21	73.05	75.76	70.29
Syria				4.15	65.56	64.49	66.58
Tunisia	97.29	98.20	97.73	1.44			
Turkey	95.56	92.96	94.28		74.95	70.27	79.49

SOURCE: World Bank Edstats.

MENA societies expanded the education enrolment faster than other regions of the world except East Asia. However high rates of unemployment among youth and low productivity from education suppressed the potential of this achievement

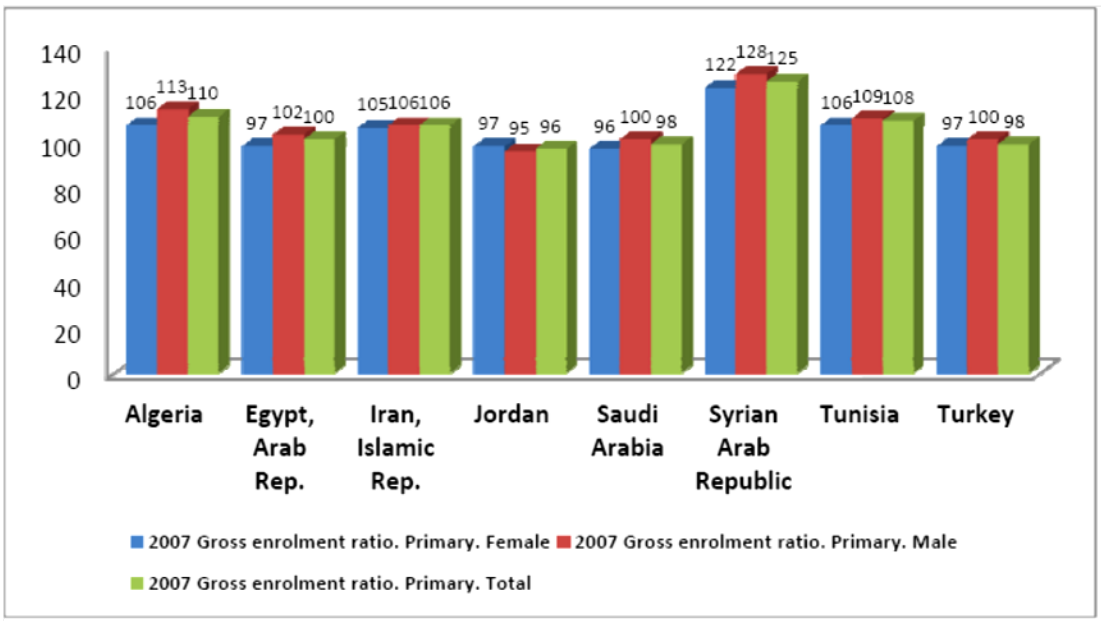
(Dhillon and Yousef 2009; Yousef 2004). Despite impressive progress, the average level of education among the population is still lower in MENA than in East Asia and Latin America. The average gross enrolment rate in secondary schools in MENA in 2003 was 75 percent, compared to 78 and 90 percent for East Asia and Latin America, respectively(Galal 2007).

Figure 2-1: Gross Enrolment Rates in MENA (1970-2003) (%)



SOURCE: World Bank, 2007

Figure 2-2: MENA enrolment ratio of primary education



SOURCE: World Bank Education stats.

Figure 2-2 shows that most of MENA region countries achieved or about to achieve the universal enrolment rates for primary education. The lack of accurate and

detailed data on net enrolment in many of these countries is a critical problem. The enrolment ratios for secondary education indicate large dropout rates of students at lower and upper secondary in Arab states (Table 2.3). Students leave schools for different reasons, but one important reason is the quality of education.

Table 2.3: Gross enrolment ratios in Arab states and the World, 1999 and 2006

	Gross enrolment ratios %			
	Lower secondary School year ending in		Upper secondary School year ending in	
	1999	2006	1999	2006
World	73	78	46	53
Developing countries	67	75	37	46
Developed countries	102	103	98	99
Countries in transition	91	89	87	88
Sub-Saharan Africa	27	38	19	24
Arab States	73	81	47	54
Central Asia	85	95	80	84
East Asia and the Pacific	80	92	46	58
South and West Asia	62	66	31	39
Latin America and the Caribbean	96	102	62	74
Caribbean	67	72	39	43
Latin America	97	103	63	76
North America and Western Europe	102	103	98	98
Central and Eastern Europe	93	89	80	85

Source: EFA Global Monitoring Report 2009, www.efareport.unesco.org, p 86.

The Arab Human Development Report (2003) states that there are important shortcomings from the building knowledge process covering 6 of our 8 selected countries. There are entire generations of Arabs who have not read literary works because they were not accustomed to do so in school. Unlike developed countries, where creative pursuits are taken for granted, schools in the Arab world have simply neglected creative potential and concentrated on producing graduates with certificates (diploma). Passing tests of narrow scheme of skills based on school textbooks have been the ultimate goal for both students and their parents. MENA students' performance in TIMSS 2007 shows a great gap relative to most participating countries for maths and science.

2.5 Comparative descriptive statistics for MENA countries in TIMSS

This section presents descriptive statistics on MENA countries' performance in TIMSS. From 49 participant countries, 18 MENA countries participated in TIMSS 2007 round namely; Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon,

Morocco, Oman, Palestinian National Authority, Qatar, Saudi Arabia, Syria, Tunisia, Turkey, United Arab Emirates (Dubai), and Yemen.

This study considers the eighth grade students at 8 countries: Algeria, Egypt, Iran, Jordan, Saudi Arabia, Syria, Tunisia, and Turkey. The remaining countries are excluded for different reasons; sample issues stated by TIMSS team (Morocco and Yemen); small countries similar to a selected country's education system, such as Bahrain, Kuwait, Lebanon, Oman, Qatar, and (Dubai) from United Arab Emirates; or countries have totally different education system like Israel and Palestinian National Authority.

Following TIMSS guidelines for sampling, Table 2.4 presents the sample for each of the countries and shows the full population size. The large number of schools in Iran and Turkey reflects the size of the population. Egypt has the second largest 8th grade population but half the number of schools less populous of Turkey. All the selected countries tested the students only in the official language of the country except Egypt which also tested in English. One class was chosen for the sample except for Saudi Arabia and Tunisia when the measure of size (school population) is greater than or equal to 140 and 375 students, respectively.

Table 2.4: TIMSS sample for MENA selected countries

Country	8th grade population		8th grade TIMSS sample			Testing language
	Schools	Students	Schools	Students	Classes	
Algeria	3891	624353	149	5447	1	Arabic
Jordan	1691	108856	200	5251	1	Arabic
Saudi Arabia	6271	332479	165	4243	1, 2 if MOS ≥140	Arabic
Syria	3756	270389	150	4650	1	Arabic
Tunisia	804	176555	150	4080	1, 2 if MOS ≥375	Arabic
Iran	29956	1475368	208	3981	1	Farsi
Turkey	16112	1163836	146	4498	1	Turkish
Egypt	8179	1342127	233	6582	1	Arabic, English

NOTE: MOS measure of size indicates the number of students in school
SOURCE: TIMSS technical report 2007.

A common factor among MENA countries is the low performance of its students in maths and science relative to international peers. Surprisingly, MENA's lowest performing countries are among the highest in per capita income. Saudi Arabia, Qatar, Oman, Kuwait exhibit poor performance in maths and science. Qatar has the highest per-capita income among MENA countries and indeed among the top ten around the world. Saudi Arabia is classified as a high income non OECD country though it is average performance is the lowest in MENA. An exception is of Turkey

with both the highest GDP per capita in the sample and the highest test scores. The general picture, however, is low achievements in all countries with average test scores below 450 points.

Table 2.5: Average maths and science scale scores of TIMSS 2007 countries (8th grade)

Country	Maths	(s.e.)	Country	Science	(s.e.)
Chinese Taipei	598	*4.5*	Singapore	567	*4.4*
Korea, Republic of	597	*2.7*	Chinese Taipei	561	*3.7*
Singapore	593	*3.8*	Japan	554	*1.9*
Hong Kong SAR	572	*5.8*	Korea, Republic of	553	*2.0*
Japan	570	*2.4*	England	542	*4.5*
Hungary	517	*3.5*	Hungary	539	*2.9*
England	513	*4.8*	Czech Republic	539	*1.9*
Russian Federation	512	*4.1*	Slovenia	538	*2.2*
United States	508	*2.8*	Hong Kong SAR	530	*4.9*
Lithuania	506	*2.3*	Russian Federation	530	*3.9*
Czech Republic	504	*2.4*	United States	520	*2.9*
Slovenia	501	*2.1*	Lithuania	519	*2.6*
TIMSS scale average	**500**	***0.0***	Australia	515	*3.6*
Armenia	499	*3.5*	Sweden	511	*2.6*
Australia	496	*3.9*	**TIMSS scale average**	**500**	***0.0***
Sweden	491	*2.3*	Scotland	496	*3.4*
Malta	488	*1.2*	Italy	495	*2.8*
Scotland	487	*3.7*	Armenia	488	*5.8*
Serbia	486	*3.3*	Norway	487	*2.2*
Italy	480	*3.0*	Ukraine	485	*3.5*
Malaysia	474	*5.0*	**Jordan**	**482**	***4.0***
Norway	469	*2.0*	Malaysia	471	*6.0*
Cyprus	465	*1.6*	Thailand	471	*4.3*
Bulgaria	464	*5.0*	Serbia	470	*3.2*
Israel	463	*3.9*	Bulgaria	470	*5.9*
Ukraine	462	*3.6*	Israel	468	*4.3*
Romania	461	*4.1*	Bahrain	467	*1.7*
Bosnia and Herzegovina	456	*2.7*	Bosnia and Herzegovina	466	*2.8*
Lebanon	449	*4.0*	Romania	462	*3.9*
Thailand	441	*5.0*	**Iran, Islamic Republic of**	**459**	***3.6***
Turkey	**432**	***4.8***	Malta	457	*1.4*
Jordan	**427**	***4.1***	**Turkey**	**454**	***3.7***
Tunisia	**420**	***2.4***	**Syrian Arab Republic**	**452**	***2.9***
Georgia	410	*6.0*	Cyprus	452	*2.0*
Iran, Islamic Republic of	**403**	***4.1***	**Tunisia**	**445**	***2.1***
Bahrain	398	*1.6*	Indonesia	427	*3.4*
Indonesia	397	*3.8*	Oman	423	*3.0*
Syrian Arab Republic	**395**	***3.8***	Georgia	421	*4.8*
Egypt	**391**	***3.6***	Kuwait	418	*2.8*
Algeria	**387**	***2.1***	Colombia	417	*3.5*
Colombia	380	*3.6*	Lebanon	414	*5.9*
Oman	372	*3.4*	**Egypt**	408	*3.6*
Palestinian National Authority	367	*3.5*	**Algeria**	**408**	***1.7***
Botswana	364	*2.3*	Palestinian National Authority	404	*3.5*
Kuwait	354	*2.3*	**Saudi Arabia**	**403**	***2.4***
El Salvador	340	*2.8*	El Salvador	387	*2.9*
Saudi Arabia	**329**	***2.9***	Botswana	355	*3.1*
Ghana	309	*4.4*	Qatar	319	*1.7*
Qatar	307	*1.4*	Ghana	303	*5.4*

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS) 2007

2.5.1 **International Benchmarks**

TIMSS defined four benchmark scores on achievement scales to describe what learners know and can do in maths and science. The benchmarks selected to represent the range of performance shown by learners internationally at four cut points.

Table 2.6: TIMSS International Mathematics Benchmarks

International Benchmarks	*Maths*
(AIB) Advanced (625 and above)	Students can organize and draw conclusions from information. Students can express generalizations algebraically and model situations. Apply their knowledge of geometry in complex problem situations and derive and use data from several sources to solve multistep problems.
(HIB) High (550 - 625)	Students can apply their understanding and knowledge in a variety of relatively complex situations. Students can work with algebraic expressions and linear equations. Students use knowledge of geometric properties to solve problems. They can interpret data in a variety of graphs and table and solve simple problems involving probability.
(IIB) Intermediate (475-550)	Students can apply basic mathematical knowledge in straightforward situations. They understand simple algebraic relationships. They can read and interpret graphs and tables. They recognize basic notions of likelihood.
(LIB) Low (400-475)	Students have some knowledge of whole numbers and decimals, operations, and basic graphs.

SOURCE: Gonzales et.al,(2008) Highlights from TIMSS 2007, National Centre for Education Statistics

There is clear evidence from Table 2.7 that MENA countries suffer from low quality educational outcomes. Forty percent or more of students did not reach the low benchmark of basic knowledge of mathematics.

Table 2.7: Percentage of Students Reaching the TIMSS International Benchmarks in Mathematics

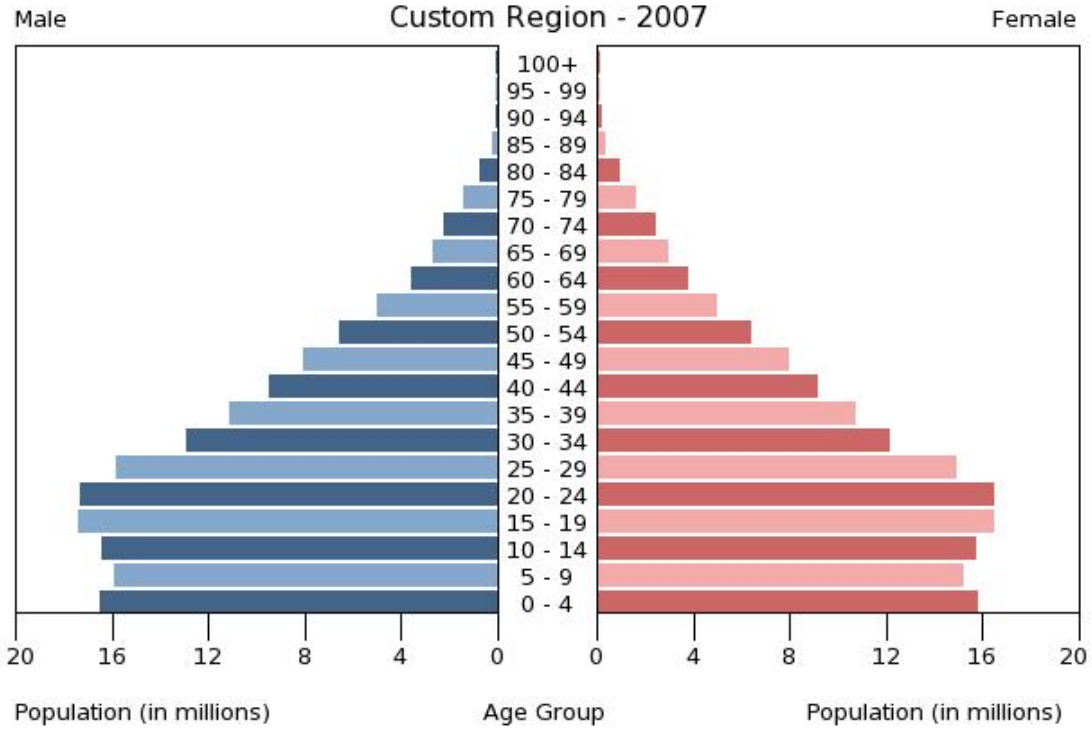
	Advanced (625)	High (550)	Intermediate (475)	Low (400)	Below 400
Jurisdiction	**Percent**	**Percent**	**Percent**	**Percent**	
Algeria	#	#	**7**	**41**	**59**
Armenia	6	27	63	88	
Australia	6	24	61	89	
Bahrain	#	3	19	49	
Bosnia and Herzegovina	1	10	42	77	
Botswana	#	1	7	32	
Bulgaria	4	20	49	74	
Chinese Taipei	45	71	86	95	
Colombia	#	2	11	39	
Cyprus	2	17	48	78	
Czech Republic	6	26	66	92	
Egypt	**1**	**5**	**21**	**47**	**53**
El Salvador	#	#	3	20	
England	8	35	69	90	
Georgia	1	7	26	56	
Ghana	#	#	4	17	
Hong Kong SAR	31	64	85	94	
Hungary	10	36	69	91	
Indonesia	#	4	19	48	
Iran, Islamic Rep. of	**1**	**5**	**20**	**51**	**49**
Israel	4	19	48	75	
Italy	3	17	54	85	
Japan	26	61	87	97	
Jordan	**1**	**11**	**35**	**61**	**39**
Korea, Rep. of	40	71	90	98	
Kuwait	#	#	6	29	
Lebanon	1	10	36	74	
Lithuania	6	30	65	90	
Malaysia	2	18	50	82	
Malta	5	26	60	83	
Norway	#	11	48	85	
Oman	#	2	14	41	
Palestinian Nat'l Auth.	#	3	15	39	
Qatar	#	#	4	16	
Romania	4	20	46	73	
Russian Federation	8	33	68	91	
Saudi Arabia	#	#	**3**	**18**	**82**
Scotland	4	23	57	85	
Serbia	5	24	57	83	
Singapore	40	70	88	97	
Slovenia	4	25	65	92	
Sweden	2	20	60	90	
Syrian Arab Republic	#	**3**	**17**	**47**	**53**
Thailand	3	12	34	66	
Tunisia	#	**3**	**21**	**61**	**39**
Turkey	**5**	**15**	**33**	**59**	**41**
Ukraine	3	15	46	76	
United States	6	31	67	92	

Rounds to zero.

NOTE: Benchmarks refer to the percentage of students who reached each cut-point score along the scale (400, 475, 550, and 625).

SOURCE: Data from the International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2007.

Figure 2-3: Population Pyramid in MENA, 2007



SOURCE: The International Data Base (IDB), US Census Bureau 2012

MENA's demographic distribution of the population indicates a large share for youth and young children (Figure 2-3). The main challenge facing these countries (as evidenced in the 'Arab Spring') is reform, equality, and freedom. Education is important to achieve those goals but education as shown suffers from poor quality outputs. To work out a successful transitional period and to achieve the goals of development, MENA countries should pay attention to education reform and focus on the quality not the quantity. Inequality, gender or classes, in education and employment, should be defined and removed from the new societies in MENA. One important step toward achieving those goals is to define the determinants of education quality and the sources of gender inequality in the educational output.

Chapter 3

SCHOOL EFFECTS ON STUDENTS TEST SCORES IN EGYPT

3.1 Introduction

This chapter uses data from large comprehensive international student achievement tests – Trends in International Mathematics and Science Study (TIMSS) – to estimate the impact of parental education, other measures of Social-Economic status (SES) and school inputs on students' achievements in Egypt. Although there are now numerous studies on the factors influencing education quality in developed and developing countries (Hanushek and Lavy 1994; Hanushek and Woessmann 2007; Lloyd et al. 2001), few include Arab countries and studies on Egypt focus on education problems such as enrolment and dropout rates and how these affect quality.

Human capital quality measured by cognitive achievement tests directly and indirectly influences productivity and long-run growth. It is a research priority to investigate sources of human capital quality. Governments, the main education services provider around the world, should apply rational, efficient, and equitable policies based on true research results (Hanushek and Luque, 2003; Woessmann, 2003).

This study estimates the impact of student characteristics and family background on the one hand (the set of student variables) and teacher's characteristics and school resources on the other (the set of school variables), on cognitive achievement in Egypt. The broad question addressed is: what are the major determinants, distinguishing Social-Economic Status (SES) and school inputs, of students' cognitive achievements (as captured by test scores)? Using test scores for 8th grade (age 14) students in mathematics and science for 2007, we examine the influence of SES and school variables. The literature on education production functions reveals no clear systematic relationship between school resources and student achievement;

teacher quality is the only factor that usually has a significant influence (Hanushek 1995).

The chapter is structured as follows. Section 3.2 provides an overview of education in Egypt. Section 3.3 describes the TIMSS data for Egypt. Section 3.4 outlines the empirical model and section 3.5 discusses the results: core findings and further analysis with specific attention to school fixed effects and the impact of test language and section 3.9 concludes.

3.2 Egypt's education system

With more than 17 million students, 821 thousand teachers and 40 thousand schools, the Egyptian education system is one of the largest in the world and the largest in MENA (Middle East North African Countries)[6]. The Egyptian education system is divided into Al-Azharite system (Islamic school) and a secular system. The first is supervised by ALAZHAR[7] and accounts for 9.8% of students while the secular system includes Arabic, language and religious schools; the 90.2 percent of all students in the secular system are divided into public and private education sectors (comprising 83 percent and 7.2 percent, respectively)[8]. All are under the supervision of the Ministry of Education. Since 1981, free compulsory education is provided at the primary and preparatory stages.

The school enrolment age is 6 years. The 9 years of basic education is divided into six years primary stage and 3 years preparatory stage or lower secondary (ISCED 2). Vocational preparatory education is provided to serve slow learners in primary and preparatory education. The preparatory stage (grade 9 at age 15) exit exam (held at the governorates[9] level) determines whether students are qualified for general or vocational secondary school. The secondary stage is divided into vocational (3 to 5 years) and general academic (3 years) schools. The test scores of the secondary school exit examination (country level) determine their access to higher education

[6] UNESS, (2008), Arab Republic of Egypt, p 18

[7] ALAZHAR is an Official mosque and university at Cairo, the world centre of Sunni Islamic learning.

[8] Ministry of Education strategic plan, (2008), Egypt

[9] A governorate is an administrative division of a country. It is equivalent to a state or province.

which includes universities and institutes (3 to 6 years). Students upgrade to the following year is conditional on their exams' results, so there is grade repetition (Ministry of Education 2008).

Both mixed and single sex education is provided in Egypt. Typically, boys and girls attend mixed classes at the primary level with single sex-schools being mainly at the preparatory level. In the rural areas where there are insufficient students to create two schools, students enrolled in the same school with either mixed or single sex classes.

Tables A-5.1–A-5.3 in Appendix A-5 show selected poverty, social, and educational characteristics of Egypt compared to MENA[10] and lower middle income countries. The figures show Egypt in a good position regarding enrolment compared to MENA except for pre-primary enrolment. However, 3.1 percent repeaters in primary stage and 5 percent drop out which is relatively high interruption in the education system.

The Egyptian education system is highly centralised regarding administration, curriculum and examination. The Ministry of Education has the main responsibility for all education issues, collaborating with the ministry of Finance and the governorates regarding other organizational and financial issues. The Egyptian education system diagnostic identifies the following as issues: shortage of school buildings at the basic education level, existence of poor quality vocational preparatory education, weak participation of the private and cooperative sectors in education, high repetition rates in basic education, poor reading and writing skills of pupils in basic education, increases in the education wage bill (large number of employees not high wages), administrative jobs are overstaffed (1:1.26), shortages in basic education qualified teachers (41percent do not have university degree), training mismatch with the actual needs of teachers, curricula problems, existence of traditional teaching and evaluation methods, and the spread of private tutoring[11].

[10] Middle-East and North Africa countries

[11] National Strategic Plan for Pre-University Education Reform in Egypt (2007/08 - 2011/12), P 249

3.3 Data and descriptive statistics

The Trends in International Mathematics and Science Study (TIMSS) carried out by the International Association for the Evaluation of Educational Achievement (IEA), an independent organization, collects data on students at fourth (9-10 years) and eighth (14-15 years) grade for a large sample of countries to give comparative assessments dedicated to improving teaching and learning in maths and science for students around the world.

This study relies on data from TIMSS on student tests results with extensive information from the student background questionnaire and teachers and school characteristics for both maths and science. The TIMSS target population is fourth and eighth grades. Each participant country followed a uniform sampling approach applied by TIMSS team to assure high quality standards. A two stage stratified cluster design was followed: at the first level a random schools sample is selected and within each of these schools one or two classes are selected at the second stage randomly. All students in a selected class were tested for both maths and science. Two main issues need to be addressed in using TIMSS; the complex multi-stage sample design mentioned above and the use of imputed scores or "plausible values" (Foy and Olson 2009).

3.3.1 **Egypt in TIMSS 2007**

Egypt has 8,179 schools with 1,342,127 students at the eighth grade. The selected TIMSS sample for Egypt is 233 schools with 6,582 students which produces an estimated population of 1,059,228 students. There are 234 teachers of integrated science and 234 teachers of maths. TIMSS tests for maths and science are administered in both Arabic and English while the background questionnaire is administered only in Arabic.

Table A-3.4 in the appendix shows average achievement of maths and science in Egypt and some developed and developing countries. The substantial difference in maths scores between Egypt and Spain, US, England, and Japan is evident (it exceeds 100 points). The situation compared to other Arab and MENA countries is mixed; while Egyptian students' achievement is higher than Algeria, Morocco,

Kuwait, Saudi Arabia, Oman and Qatar, it is lower than Turkey, Israel, Iran, Dubai, Lebanon, Jordan, Tunisia, Bahrain and Syria. In Sub-Saharan African countries such as Ghana and Botswana, students' achievement in maths is behind that in Egypt.

In Egypt, the TIMSS sample was 49.5 percent girls. The overview concentrates on the Egypt 2007 TIMSS maths scores with some comparison to the 2003 round. Egypt maths scores declined from 406 in 2003 to 391 points in 2007 representing a statistically significant decline of 15 points. Girls' maths achievement scores declined from 406 in 2003 to 397 in 2007, whereas boys' achievement declined significantly from 406 to 384. Gender differences in achievement scores were not significant in 2003 (less than one point difference) whereas they were at the 95% level in 2007 (girls 13 points higher on average).

Science test scores achievements declined from 421 in 2003 to 408 in 2007 on average. This fall of 13 points is statistically significant at the 5% level Appendix A-5 (Table A-3.5). The distribution of marks from Figure 3-1 to Figure 3-5 indicates that students do better in science in general. Girls outperform boys and language schools outperform Arabic schools for both maths and science. The test scores appear to be normally distributed.

Figure 3-1: Distribution of student achievements by subject

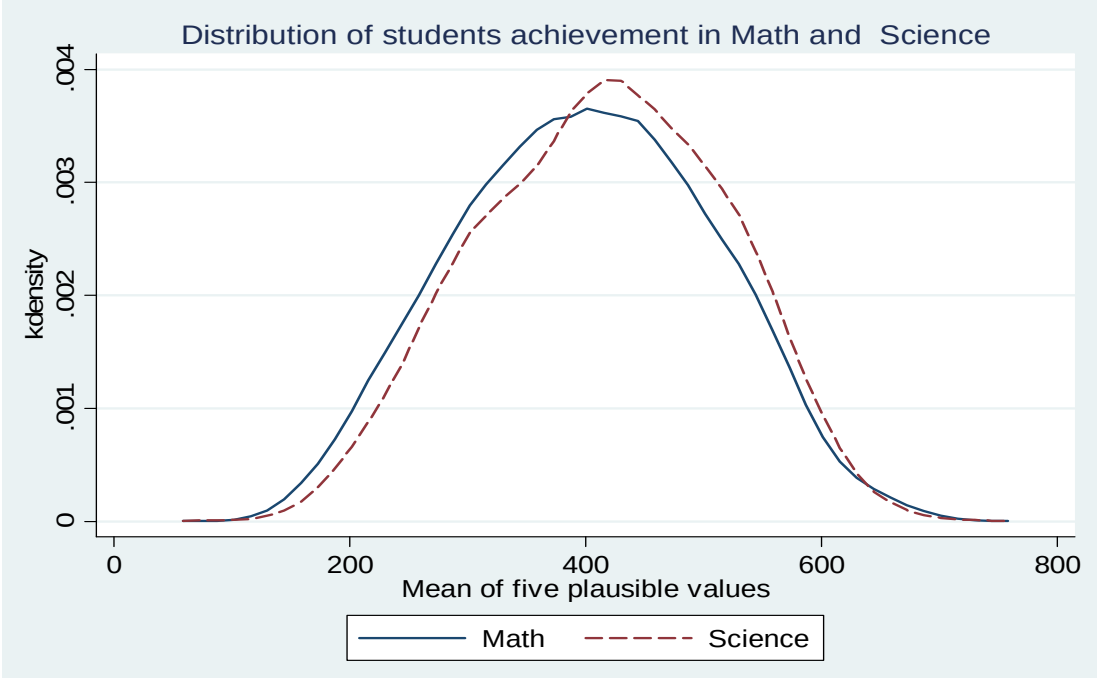


Figure 3-2: Distribution of student Maths achievement by school language

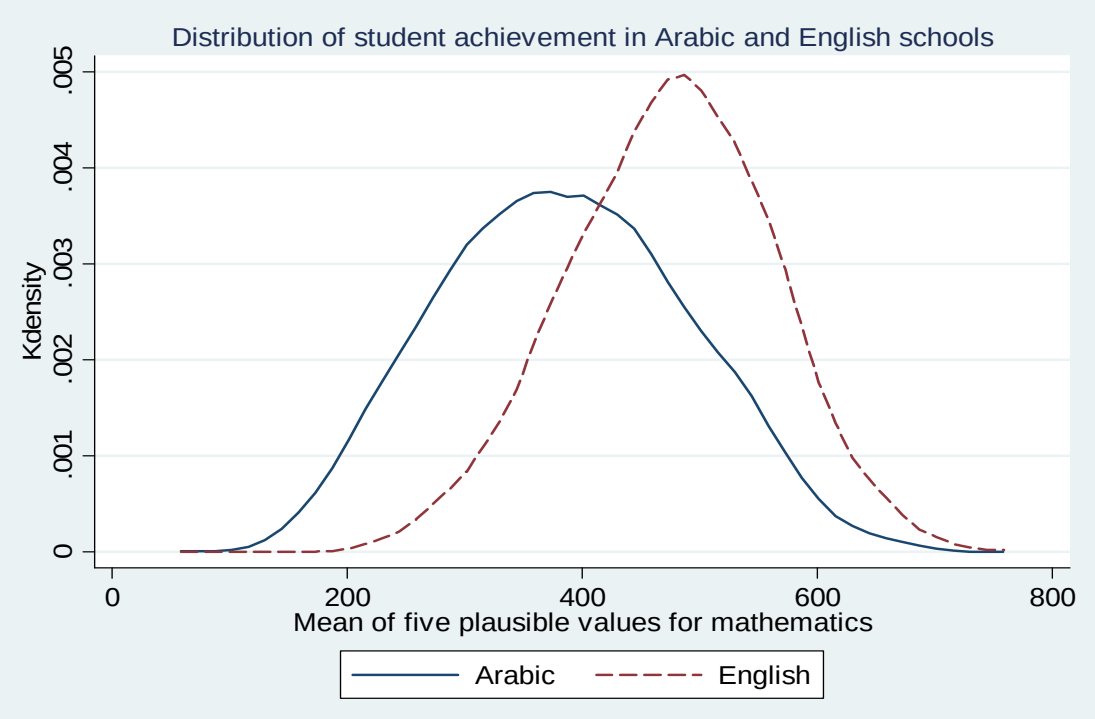


Figure 3-3: Distribution of student Maths achievement by gender

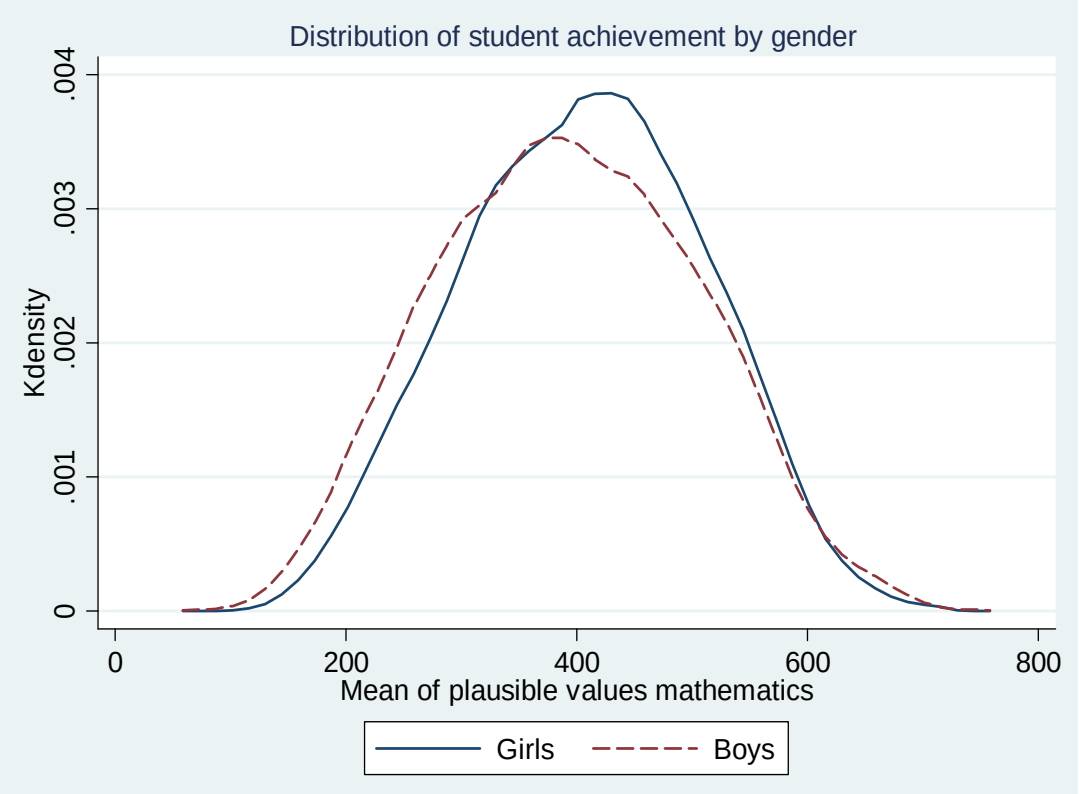


Figure 3-4: Distribution of student Science achievement by school language

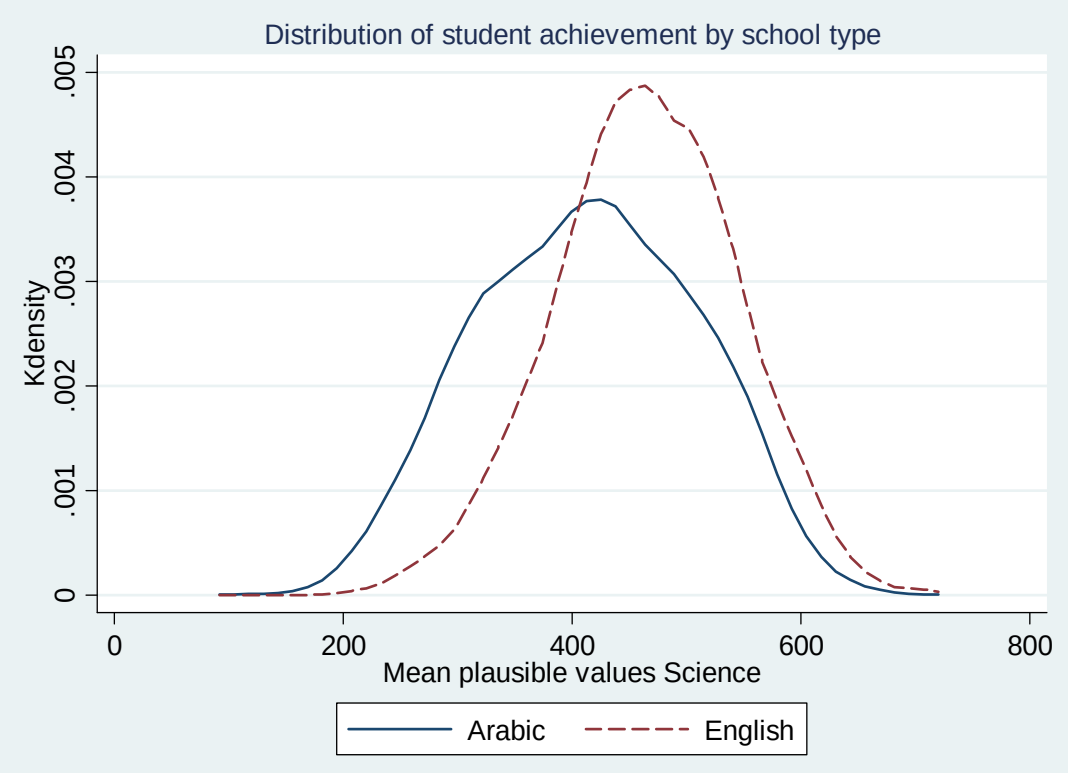
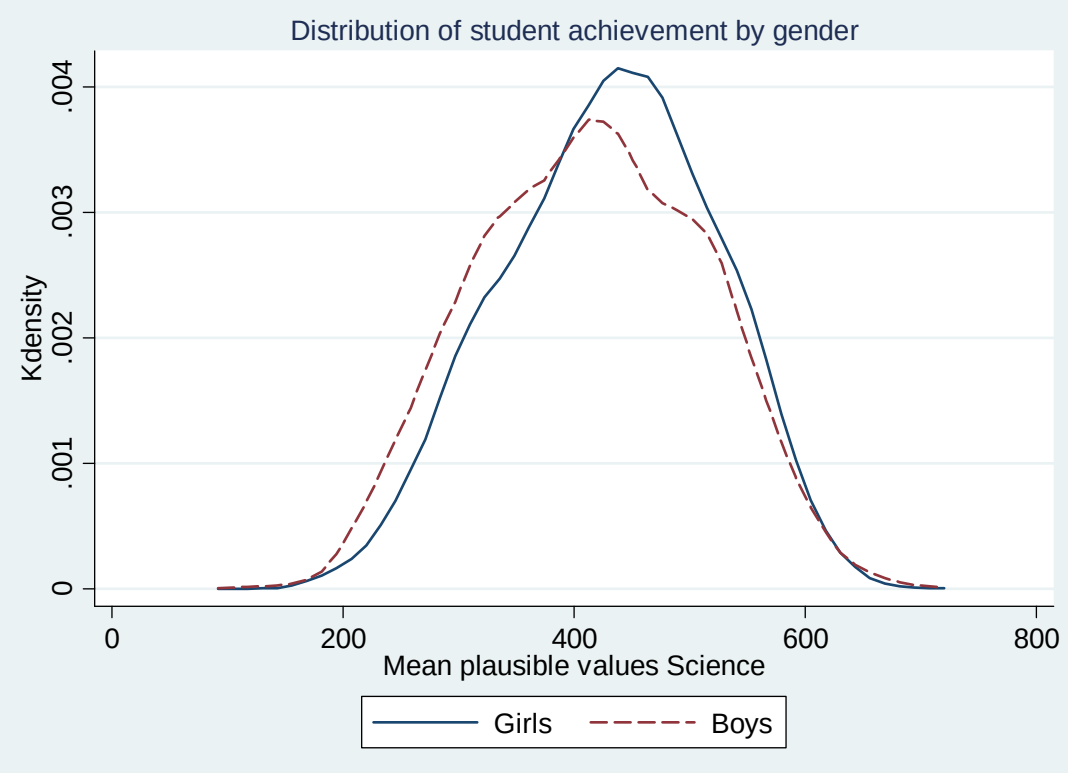


Figure 3-5: Distribution of student science achievement by gender



As explained in Chapter 2, TIMSS benchmark scores on achievement scales describe what learners know and can do in maths and science. Table A-3.6 in the appendix indicates that 53 percent of Egyptian students do not even satisfy the low international benchmark (which is that students have some knowledge of whole numbers and decimals, operations, and basic graphs) of maths compared to 48% of students in 2003 TIMSS and 45% for science.

Arab countries such as Jordan and Tunisia fare better than Egypt with 39% of students below the low benchmark; Bahrain is slightly better and Syria has the same percentage as in Egypt; in Oman, Algeria, Morocco, Qatar, and Saudi Arabia performance was much worse. Students' average age in the TIMSS 2007 sample for Egypt is 14.11. Younger and older students perform less well in maths than students of average age.

Student performance in maths with respect to the language of testing shows a large gap in favour of those tested in English. The direct conclusion from these means could be misleading because of the difference in the sample size between the two groups and because some possible third variables could be influential, such as language schools having more school resources and students from higher income families.

Egyptian learners performed relatively well in algebra and geometry and less well in the learning domains of numbers, data and chance. The TIMSS 2007 maths was designed to have three main cognitive categories to measure different types of abilities of the learners. The three cognitive domains are: knowing, applying and reasoning. Egyptian students show better performance in knowing and reasoning cognitive skills compared to applying.

3.3.2 **Descriptive statistics on home background and school resources**

As mentioned previously, the TIMSS data set is very large and supplemented by different questionnaires with a total of 88 questions: 33 are answered by the students, 33 are answered by teachers, and 22 are answered by school principal.

Table 3.1: Descriptive Statistics of included variables

(a)			(b)		
Family and student background	**Mean**	**std. dev.**	**Teacher characteristics and school resources**	**Mean**	**std. dev.**
Mother education level			**Test language**[12]		
Not finished elementary school	0.25	0.43	Arabic	0.97	0.16
Elementary/middle school	0.26	0.44	English	0.02	0.16
Secondary school	0.11	0.31	**Teacher gender**		
2 years of post secondary school	0.12	0.32	Male	0.71	0.45
University degree or higher	0.08	0.28	Female	0.20	0.40
Do not know/missing	0.19	0.39	**Teacher years of experience**[13]	12.20	8.61
Father education level			**Teaching certificate**		
Not finished elementary school	0.15	0.35	Yes	0.65	0.48
Elementary/middle school	0.28	0.45	No	0.16	0.37
Secondary school	0.12	0.33	**Availability of school resources MATHS**		
2 years of post secondary school	0.17	0.37	High	0.27	0.44
University degree or higher	0.10	0.30	Medium	0.67	0.47
Do not know/missing	0.18	0.38	Low	0.05	0.23
Parents nationality			**Teacher formal education**		
Both parents are Egyptians	0.77	0.42	Not university degree	0.03	0.16
Only one parent or neither parent	0.19	0.39	University degree	0.82	0.39
Number of books at your home			Postgraduate studies	0.06	0.23
None or few	0.67	0.47	**Type of community**		
One bookcase (26 to 100 books)	0.21	0.41	More than 50000 people	0.46	0.50
Two bookcases or more	0.09	0.29	Less than 50000 people	0.51	0.50
Home possessions			**Perc. of disadvantaged std**		
High	0.12	0.33	Less than 50 percent	0.52	0.50
Medium	0.36	0.48	More than 50 percent	0.43	0.50
Low	0.41	0.49	**Class size for maths**		
Gender of student			Less than 41	0.42	0.49
Boy	0.51	0.50	41 or more	0.56	0.50
Test language spoken at home			SCIENCE		
Always	0.66	0.47	Availability of school resources for science		
Almost always, sometimes, or never	0.32	0.47	High	0.374	0.484
Computer use			Medium	0.570	0.495
Both at home and school	0.21	0.41	Low	0.039	0.194
Either home or school	0.56	0.50			
Pc only at places other than home or none at all	0.16	0.37			
PlayStation or similar games					
Yes	0.37	0.48			
No	0.59	0.49			

Note: Sample size is 6582, all variable are dummy except for teacher experience and class size included in some estimations as continuous. "Do not know" responses are treated as missing; note that it is the students who answer the questions.

For many questions a list of possible answers is provided, for example parental educational attainment lists seven categories. Preliminary analysis using the full range of categories revealed that many variables have no significant effect on test scores and/or have many missing observations. Where appropriate and justified by

[12] The un-weighted descriptive statistics indicates 82% for Arabic and 18% for English

[13] Note: it is included as continuous

this analysis, we have combined or omitted categories. This section outlines the coding we use for the explanatory variables.

Table 3.1 panel (a) presents the descriptive statistics for student characteristics, family background and Social-Economic status (SES) for Egypt. Parental education includes mother's education and father's education measured by the highest educational level attained for each of them measured in six categories: not finished elementary school; finished elementary or middle school; finished secondary school; 2 years of post secondary school; University degree or higher; and "don't know". The share of students in the TIMSS sample of Egypt whose mothers have not finished elementary school is 20 percent compared to 12 percent for fathers; mother's with university degree or higher (postgraduate studies)[14] are 12 percent compared to 16 percent for fathers. Approximately 15 percent of the students reported they do not know their mothers' highest educational level attained, and a similar percentage does not know their fathers' educational level attained.

The number of books in the students' home is coded in three categories: none or few books; one bookcase full of books; and two bookcases or more. The share of students from homes with no or few books is 63 percent compared to 25 percent with one bookcase and 13 percent with two bookcases or more.

The home possessions index, used as a proxy for family SES, is coded as high, medium or low. This index is constructed using data from four selected variables investigating different types of possessions: computer; study desk; internet connection; and satellite TV channels. Those variables were selected out of eight variables indicating home possessions using principal component analysis to identify the most influential variables for constructing the index. The construction of an index is problematic. The absence of a convenient approach of selecting variables to proxy living standards were shown by Montgomery et al. (2000), who argue that most studies used ad-hoc strategy to select variables. Recent studies employed principal component analysis (PCA) to derive Social-Economic Status (SES) indices

[14] The coding refers to postgraduate education but may not mean a Masters or PhD; it is likely to refer to other higher or professional qualification.

from data sets which have no income measures such as Demographic Health Surveys (DHS) (Filmer and Pritchett 2001; McKenzie 2005).

PCA was employed to capture the most influential variables among eight variables. A home possession index was then constructed using the most influential variables based on their shares in explaining the variation in the PCA. The share of students who coded high is 24 percent, 36 percent coded low and 39 percent coded medium (Appendix B-5).

Parents' nationality is measured by two categories: both parents are Egyptian; one or both have foreign nationality. Almost 84 percent of students are of Egyptian parents. The test language is either Arabic or English. The majority of students took the TIMSS maths test in Arabic (83 percent of the sample). "How often the language of testing spoken at home?" is measured by two categories: always spoken at home; and with "almost always", "sometimes", and "never" combined into one category[15].

Two more variables were introduced to investigate their impact on student achievement. Computer use is coded in three categories: both at home and school (28 percent); either at home or school (56 percent); and only at places other than home/school or not at all (16 percent). Empirical evidence from a study on "home computer use and development of human capital" indicates that home computer use had significantly lowered the Romanian students' grades in Maths, English, and Romanian especially for low-income children (Malamud and Pop-Eleches 2011). Students were asked if they have a PlayStation or similar games at home; 42 percent responded yes and 58 percent said no. The effect of this on test scores is ambiguous; it could reduce scores if access to games is a distraction from study at home, but if having such games is an indicator of household wealth it may be positively associated with test scores if students from wealthier households tend to perform better (the index of possessions is our only control for household assets).

Table 3.1 panel (b) reports descriptive statistics for Teachers' characteristics and school resources. 80 percent of maths teachers are men. Teachers' experience is

[15] 'Almost always' is combined with other group to capture any other language spoken at home (so 'always' means only one language spoken)

measured by years of teaching which we coded in three categories: less than 10 years experience (35 percent for maths); 11 to 19 years (38 percent); and 20 years or more (27 percent). Some 82 percent of teachers have a teaching certificate. Teachers' formal education level attained is coded in three categories: below university degree (two percent); university degree (89 percent); and postgraduate degree.

The type of community is used as a proxy for the population distribution to distinguish urban (the school is in a community with more than 50000 people) and rural (a community with less than 50000 people). School locations are almost evenly divided: 55 percent of students come from communities with more than 50000 people and 45 percent come from communities of less than 50000 people. The percentage of students in a school from disadvantaged homes (a question answered by teachers) is used as a proxy for the impact of being in disadvantaged areas on student performance.

School resources are measured by two variables, class size and an index of availability of school resources for maths instruction. Class size is coded in two categories: classes with 41 students or more (47 percent) and classes with less than 41 students (53 percent). The index of availability of school resources for maths instruction, constructed by TIMSS, is based on school principals' responses to a series of questions about shortages affecting instruction.

Ten areas of shortage or inadequacies (rated on a four point scale: none = 1, a little = 2, some = 3, and a lot = 4) which could affect delivering maths instruction in a proper way were included in the index computation. General areas include: 1) Instructional materials (e.g., textbook); 2) Budget for supplies (e.g., paper, pencils); 3) School buildings and grounds; 4) Heating/cooling and lighting systems; and 5) Instructional space (e.g., classrooms); and maths-specific areas: 6) Computers for maths instruction; 7) Computer software for maths instruction; 8) Calculators for maths instruction; 9) Library materials relevant to maths instruction; and 10) Audio-visual resources for maths instruction (Olson et al. 2008b). The index of school resources for maths instruction index is coded in three levels: high; medium (57 percent); and low (four percent).

Table 3.2: Percentages of students, Parents education and average test scores

Education level	Mother					Father				
		Maths		Science			Maths		Science	
	Percent	mean	se	mean	se	Percent	mean	se	mean	se
Not finished Elementary	25.66	375.48	5.29	394.82	4.66	15.2	363.91	6.02	384.88	5.24
Elementary/middle	26.35	385.32	4.64	404.54	4.84	29.38	384.1	4.8	403.58	4.11
Secondary	10.93	421.06	6.28	438.82	5.8	12.69	408.13	6.22	423.96	6.1
post secondary (2 years)	12.14	438.34	5.32	451.56	5.32	17.19	437.43	4.92	453.01	5.04
University degree	3.66	404.95	10.56	423.85	9.67	4.38	410.61	7.39	423.49	7.34
Postgraduate studies	4.94	391.12	6.88	394.54	7.81	5.98	394.84	7.29	403.38	8.14
I do not know	16.32	378.65	5.3	398.27	5.48	15.18	372.54	5.24	393	5.42

It is clear from Table 3.2 that parents' education is associated with achievement. The highest achievers are those whose parents have intermediate to higher education (first degree). The teacher is the core of creating a supportive environment for learning process. TIMSS has information on the teaching staff, academic preparation for teaching, teachers' professional development and their readiness to teach TIMSS curriculum topics. The majority of Egyptian TIMSS maths teachers are aged between 30 and 39 years. The older the teacher the higher student performance is a clear relation from Table A-3.7. In Egypt, about 20 percent of maths learners were taught by females and 80 percent by males, without a significant difference in achievement. The average teaching experience of Egyptian teachers is 14.5 years. The results for teacher education level and achievements are mixed and no clear relation could be stated. However, it seems from Table A-3.8 that teacher satisfaction is positively correlated with teachers' performance and so students' performance. Average scores are also positively correlated with teachers' satisfaction.

The average class size in Egypt is 37 students with a great dispersion in sizes. The most common class size is 40 students which is high relative to the top performing countries. Table A-3.9 shows a tendency towards better performance with lower class size for maths and science.

The disadvantage of TIMSS data for Egypt is that they do not include data on regional distribution of school (urban/rural) or on (private/public) status. Schools with a high percentage of students from disadvantaged homes perform worse than those in schools with fewer disadvantaged students (Table A-3.10).

Table 3.3: Distribution of students whose peers are affluent at different schools

Percentage of affluent students	Arabic schools		English language schools		Total	
	N	%	N	%	N	%
Less than 10%	2,068	42	38	3	2106	32
11 to 25 %	1,552	31	18	2	1570	24
26 to 50 %	579	12	56	5	635	10
More than 50 %	766	15	990	88	1756	27
Missing	497	9	18	2	515	8
Total	5,462	100	1,120	100	6582	100

Students were tested in either Arabic or English; we assume that those tested in Arabic are enrolled in Arabic schools and the others are in English language schools. The English language schools in Egypt are mainly private schools but there are also public experimental language schools, but TIMSS does not identify these. The data indicate a bigger share of affluent students enrolled language schools (Table 3.3).

3.4 The Empirical model

The underlying model is very straightforward. The output of the educational process is directly related to a group of inputs by an education production function (EPF). We use student standardized achievements in test scores as a measure of output. Inputs include characteristics of schools, teachers, and other non-student variables and student SES variables such as family characteristics and home resources. We estimate an education production function of the following form:

$$A_{is} = \beta_0 + \delta_1 F_{is} + \delta_2 S_s + \varepsilon_{is} \qquad \textbf{(3.1)}^{16}$$

Where A is the test score of student i in school[17] s, F is a vector of family background variables and S is a vector of school characteristics variables. The coefficient vectors α, δ_1 and δ_2 are to be estimated. The error term ε has two components as we have two-stage stratified sample, the imputation error on student's level and the sample error at the school level. Table 3.1 described in detail the variables included in our estimations.

[16] We include D, a vector of dummy variables for each variable both in F and S to capture the effect of missing observations; a dummy takes the value 1 for observation with missing data and 0 otherwise (the variables themselves are set to zero if their values are missing).

[17] Egypt's sample selects only one class from each school, simplifying notation to students and schools only.

School inputs and school choice will be the parents' decision; parents may make residential choice to ensure that their children are taught in a good school (small class size, good teachers or available facilities). Parents, teachers, and schools make choices that might give rise to a non-causal association between school inputs and student achievement even after controlling for family background. This makes the empirical investigation complex seeking identification and examining the sources of the effects by different techniques and methodologies to ensure the right interpretations of results.

3.5 Main Results

The results of estimating the education production functions, equation (3.1), for TIMSS achievement test scores in Egypt are discussed comparatively for maths and science (Table 3.4). The explanatory variables are organized in blocks, starting with measures of family background and student characteristics, followed by teacher characteristics and school features. In addition a critical look is paid to possible role of school type, interaction effects, school fixed effects and test language differences. The dependant variables are the plausible values for test scores in maths and Science.

3.5.1 **Students background**

We employ three sets of dummy variables to reflect the family background of students: the father's education level, the mother's education level, and the number of books at home. We also include various variables to capture a broader picture of student background and socio-economic status.

3.5.1.1 Parental education

For Maths, student level variables have the largest and most significant coefficients in the production function. Children of a mother with secondary or two years post-secondary education perform better than children of a mother with elementary or middle school. The results suggest a significant 17 point test score increase for students if their mother has two years' post-secondary education (compared to mother with no education or did not finish elementary school) and 15 point increase

if the mother has secondary education. Although scores are lower for students whose mother finished university or postgraduate studies, this is not significant.

Table 3.4: Estimates of Family, School Background on Maths and Science Performance

Dependant variable : students' test scores (the mean of 5 plausible values)	Maths N=6582	R^2 .2422	Science N=6582	R^2 .2193
Family and student background				
Mother education level	*b*	*se*	*b*	*se*
Elementary/middle school	-3.036	*(5.101)*	-1.276	*(4.868)*
Secondary school	14.987**	*(6.216)*	16.464***	*(5.510)*
2 years of post-secondary school	17.584***	*(6.703)*	17.526**	*(7.172)*
University degree or higher	-6.723	*(6.918)*	-9.847	*(6.582)*
No or not finished elementary(omitted)				
Father education level				
Elementary/middle school	13.683**	*(6.561)*	11.773**	*(5.312)*
Secondary school	26.310***	*(6.012)*	21.762***	*(5.680)*
2 years of post-secondary school	35.144***	*(5.403)*	33.667***	*(6.584)*
University degree or higher	10.611	*(6.631)*	5.898	*(6.699)*
Never or not finished elementary(omitted)				
Number of books at your home				
One bookcase	11.126***	*(4.313)*	12.069**	*(4.798)*
Two bookcases or more	0.850	*(6.280)*	-1.033	*(6.761)*
No or few books(omitted)				
Both parents Egyptian=1	49.427***	*(5.106)*	47.361***	*(5.071)*
Home possession index				
High	34.731***	*(4.372)*	35.658***	*(5.997)*
Medium	18.558***	*(3.532)*	18.467***	*(4.228)*
Student gender (male =1)	-9.342*	*(5.422)*	-16.499***	*(5.501)*
Testing Lang. spoken at home (always=1)	-17.994***	*(3.721)*	-16.935***	*(4.165)*
Type of community (more than 50000 people = 1)	9.816	*(6.513)*	13.031*	*(7.234)*
Less than 50000 people (omitted)				
Computer use				
Both at home and school	-21.879***	*(4.965)*	-31.587***	*(6.537)*
Either home or school	-21.822***	*(4.233)*	-25.630***	*(4.457)*
Other places or none (omitted)				
PlayStation or similar games yes = 1	-19.533***	*(3.073)*	-14.602***	*(3.197)*
Teacher characteristics and school resources				
Test language (Arabic=1)	-40.758***	*(12.087)*	-14.025	*(12.033)*
Teacher gender (male = 1)	-0.642	*(7.657)*	-2.516	*(6.353)*
Teacher years of experience	1.065***	*(0.388)*	-0.221	*(0.521)*
Teaching certificate	8.057	*(9.587)*	0.740	*(7.426)*
Availability of school resources for instruction				
Medium	-3.214	*(7.580)*	-1.360	*(8.648)*
Low	-19.639	*(13.745)*	-16.327	*(17.100)*
Teacher formal education completed				
University	-5.361	*(23.189)*	-13.289	*(16.125)*
Postgraduate studies	-13.253	*(24.771)*	-22.468	*(21.729)*
Not university (omitted)				
Percentage of disadvantaged std (more than 50%=1)	-7.040	*(6.254)*	-11.697**	*(5.764)*
Cass size (more than 41 =1)	-4.920	*(6.393)*	-4.934	*(6.546)*
Less than 41 (omitted)				
Constant	400.594***	*(28.554)*	432.479***	*(23.783)*
Controls for missing included	*Yes*		*Yes*	

Sampling weights of TIMSS are used, Jackknife standard errors in parentheses, Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Note: Teacher experience square when included all coefficient are essentially the same except teacher experience is insignificant for maths.

Similar results are obtained for father's education. Fathers who completed middle and secondary school increase test score by 13 and 26 points respectively compared to those who did not complete primary education. Having a father with university or postgraduate education has the lowest (and insignificant) impact on test scores compared to a father who did not complete primary education (but not significant), while a father who completed two years post-secondary has the greatest impact (an increase of 35 points).

These findings are broadly in line with previous studies finding that parental education is important (Hanushek 2002; Woessmann 2004). However, one difference compared to results for many other countries, especially developed countries, is that the effect appears non-monotonic. In Egypt, have more educated parents is associated with higher scores up to parents with post-secondary (but pre-University) education but the effect of more education becomes negative beyond this (although, for fathers, scores are still higher compared to not having completed primary education). The lower impact of parents with university or postgraduate education may be because both parents are working so there is less home support for study, or it could be that the most educated parents have relatively lower aspirations for their children compared to pre-University educated parents (who want their children to have a better education than they had themselves).

Father's education appears more important than mother's for student performance in Egypt. Levels of education attained indicate a larger influence of fathers' education than mothers' on student test scores as well as a positive effect at all levels compared to negative coefficients for mother's highest and lowest levels of education.

Student achievement in science is better than maths: average scores in science are higher by 18 points. The coefficients estimates from the regression for the science test scores are similar to the maths estimates with respect to parent's education and books at student's home.

Parents' education follows the same non-monotonic pattern of impact as for Maths. A student whose mother completed secondary or post-secondary education (but not

university) performs better compared to students whose mother did not finish her primary education, by 17 and 18 points respectively. Fathers' education has an increasing impact on performance in science: completing middle school increases test scores by 12 points compared to a father with no education, completing secondary school improves test scores by 22 points, and completing post secondary (two years) adds 34 points. Parents with university degree or higher have no significant impact on their children's performance in science.

3.5.1.2 Home possessions and books at home: Socio-Economic Status (SES)

The third indicator of family background is the number of books in the students' home. Only having one bookcase made a significant difference, increasing test scores by 11 points for maths and 12 points for science compared to students from homes with no or few books. It is surprising that having two bookcases or more was not significant. One possible explanation is that those students who answered two bookcases or more are misreporting (bookcases could be of different sizes or they may be including magazines and newspapers, though the questionnaire told them not to count them). Another explanation supports the conjecture for parental education if highly educated parents have more books at home but give less support to their children in study.

The home possessions index (a proxy for the SES of the family) suggests that the impact of family SES on students' educational achievements is large and significant: a high level of SES increases test scores by 35 and 36 points for math and science respectively and medium levels by 19 and 18 points compared to the reference group of low SES. The effect of high SES is double the effect of medium level SES.

Private tutoring, or 'shadow education', is prevalent in Egypt and is likely to be one mechanism by which SES influences achievement. The tutoring market includes all types of schools and students at different stages of education depend on different types of tutoring. The most focused concentration is on the ninth grade and the secondary stage exit exams. Although, private tutoring is prohibited by law; this is not enforced and hence ignored (Hartmann 2008). The ninth grade exams determine whether the student will be qualified to go to a 'prestigious' general

secondary which will lead to university, and the secondary stage exit exams determine which colleges may admit a student. All grades with yearly exit exams create pressure on families for private tutoring.

3.5.1.3 Nationality and home spoken language

Native students perform better than non-natives for maths and science (the effect magnitude is slightly less for science). Students of Egyptian parents perform significantly better than students with one or both parents being foreign. The dummy variable for nationality has the largest effect on student test scores of all the significant explanatory variables - a 49 and 47 point test score increase in maths and science respectively. This is in line with findings from Woessmann (2004) on Europe and the US.

One surprising result is that students who always speak the test language at home perform significantly less well than those who speak another language. The results suggest 18 and 17 point increases if the language spoken at home is not always the test language for maths and science respectively. Out of the students who always speak the test language at home (61% of TIMSS sample), 88.7% of them took the Arabic test and only 11.3% took the English version of science test. However both English and Arabic test takers exhibit the counterintuitive result that always speaking the test language is associated with lower performance.

Table 3.5: Test language frequently spoken at home and students' achievement

Home spoken lang.	Language of testing	N	**% total**	Maths			Science		
				Mean	se	Std.dev	Mean	se	Std.dev
Always	Arabic	3551	54.77	382.96	(4.06)	96.11	401.55	(3.96)	95.31
4003 (61.75)	English	452	6.97	467.4	(10.07)	84.81	456.19	(12.46)	86.64
Almost always	Arabic	797	12.29	415.29	(5.02)	104.59	431.35	(5.45)	104.64
1129 (17.41)	English	332	5.12	490.45	(5.82)	71.88	484.25	(7.4)	74.99
Sometimes	Arabic	861	13.28	398.39	(6.53)	99.83	417.93	(6.21)	101.37
1048 (16.17)	English	187	2.88	492.64	(9.01)	72.11	476.44	(6.1)	73.08
Never	Arabic	160	2.47	370.38	(13.06)	101.31	392.71	(13.29)	101.47
303 (4.67)	English	143	2.21	488.57	(12.86)	87.1	468.01	(15.23)	87.8

Descriptive statistics (Table 3.5) show that students who took the English test perform better at all levels of regularity of speaking the language at home. Students

who speak other languages at home beside the test language perform better than students who either always or never speak the test language at home. Re-estimating using a different default category test language shows that students who speak the language of testing either "almost always", "sometimes" or "never" perform statistically significantly better by 22 points of test scores in maths higher than students who "always" speak the test language at home. As 'natives' perform better this suggest either poor performing non-Egyptian Arabs or better performing Egyptians in 'multi-lingual' households.

3.5.1.4 Gender Differences

The gender gap in general is weakly significant (10%) except for science where girls outperform boys by 13 points (statistically significant at the 5% level). Nevertheless, girls generally perform better than boys in both TIMSS tests (see further analysis in subsection 0). This is only true in 2007- there was no significant difference in 2003 (Table A-3.5).

3.5.1.5 Type of community and Poverty Levels

Neighbourhood poverty is represented by the proportion of disadvantaged students in the school. It is not statistically significantly related to students' performance in maths. However, it does have a significant negative impact on science test scores. Students who go to a school with more than 50% of students disadvantaged perform worse by 12 points in science test scores than students who attend schools with less than 50% of students disadvantaged.

We use the type of community as a proxy for the urban or rural nature of the school location. Urban community has positive and significant effect only on science achievements at 10% significance level: cities and bigger communities have more association with achievements in science than rural or small communities. Other divisions of type of community have no significant effect.

3.5.1.6 Computer usage and game consoles

The availability of home computers and video game consoles like PlayStations or similar games, represent a major innovation in the Egyptian life style, culture and

traditions. Surprisingly, students who use a computer at home and/or at school perform significantly worse than those who do not use computer at all (22 points less for maths). The impact of games consoles is similar, presumably providing a distraction to students.

The effect of using computers on test scores is much worse for science. Using computer at both places reduces student test scores by 32 point; using a computer either at home or at school reduces test scores by 26 point. Having games consoles reduces student test scores by 15 points. Including a more disaggregation categorization of computer usage does not change the findings of the chosen categories (Appendix A-5, Table A-3.12).

3.5.2 **Teacher characteristics and School background**

While intuition suggests that teachers are extremely important in affecting student achievement, few of their observed characteristics are found to have a significant impact. Only teacher experience, measured by years teaching and its square to test for decreasing returns to experience, has a statistically significant impact. While the two forms are not identically significant, they are jointly different from zero at 5% of significance, and when the squared teacher experience term is dropped, teacher experience in years has a significant positive effect on test scores.

School background and resource endowment are measured by an index for the availability of school resources and by class size. The school resources availability index[18] has no effect on performance, although low school resources are associated with lower test scores for both maths and science. Class size is one of the most important measures of school endowment in the literature but also shows no significant influence on student performance.

TIMSS provides the actual number of students and dummy variables for three groups of class size: high (41 or more), medium (25 to 40), and low (1 to 24). With "high" as the default, neither the "low" or "medium" dummies were significant. The

[18] The index is composed using factor analysis technique including five major school variables and five subject specific indicators for both Math and science (TIMSS Technical report, 2009). Disaggregating the index indicates very few significant effects for some levels and suffers from multicollinearity.

World Bank has argued it is only when class sizes reach the "large" category that they start to impede performance. We employed both variables alternatively and the results do not change. However, including only the "large" dummy (and so combining the other two as the default) reveals no significant effect in Egypt. These findings are counter-intuitive but nonetheless in line with many previous studies since the Coleman report in 1966 (Woessmann, 2003, 2004; Hanushek, 2007).

The last remaining finding concerns the impact of the test language used in the TIMSS test. The results differ for maths and science: testing language is insignificant for science, but students who take the maths test in English perform significantly better than those who take the test in Arabic. This striking finding is subject to further investigation later, in subsection 3.7.2.

3.5.2.1 Class size endogeneity and Instrumental Variables (IV)

The problem in estimating class size effects is that many factors might influence such decision which might affect the casual relationship between class size and student performance. Parents and/or school could influence the placement decision. For example, parents might choose less crowded classes for their children based on their performance; and teachers and school principals might sort student into differently sized classes based on behavioural or academic reasons. This may be bias the estimates of education production function by the endogeneity of class size with respect to student performance.

To solve this issue, we need to identify class size effect that relies only on exogenous variation in class size. The school fixed effects eliminates the effects of between school sorting. However, the within school sorting may still affect our estimates. Therefore, instrumental variables (IV) approach needed to eliminate the endogenous biased effect of class size and make sure that the estimates is based on the exogenous part of the effect.

The valid instrumental variable should be highly correlated with the class size measure variable and uncorrelated with test scores. Woessmann and West (2006) instrumented the class size effect using TIMSS data by the average class size at the grade level. Akerhielm (1995) used the average class size and the eighth grade

enrolment in the school as instruments for the actual class size. Akerhielm constructed the variable by taking the average class size of all the students in the school in a given subject that responded to the NELS survey. Both studies claimed that the two instruments are valid and are correlated directly with the actual class size and are unrelated to the student performance. Nonetheless, Woessmann and West criticized the usage of grade enrolment in the school as it might be directly influence test scores away from class size.

In our case, TIMSS data provide the two variables. From the school questionnaire, the school principal answered a question on the average class size of the eighth grade and reported the total number of students at the eighth grade. (Altinok and Kingdon 2012) suggested using the differences between the two subjects class size as an instrument, unfortunately this is invalid in the case of Egypt as students placed in the same class room for all subjects.

Since TIMSS chooses one class from each school it is not possible to run the fixed effect instrumental variable approach or using pupil teacher ratio as an instrument for class size. So, we employ the two instruments together and separately in the first instance and investigate the validity using the proper tests of under-identification test, weak instrument or weak identification test and over-identification test.

The estimates of class size IV use the five plausible values of maths and science test scores and jackknife standard errors to deal with clustering. The two instruments show significant effect on actual class size in the first stage which suggests a relevance of the selected instruments. The under-identification test is an LM test of whether the equation is identified, i.e., that the excluded instruments are "relevant", meaning correlated with the endogenous regressor, i.e. actual class size. The test results (Table 3.7) show that we reject the null of under-identification in favour of identified model. The weak instrument "Weak identification" arises when the chosen instruments are correlated with the endogenous regressor (class size), but only weakly.

Table 3.6: Estimates of Family, School Background on Maths and Science Performance using class size Instrumental Variables (IV)

Dependant variable : students' test scores (the mean of 5 plausible values)	Maths N=6582 R^2 .2422		**Maths Class Size (IV)** N=6221 R^2 .2366		Science N=6582 R^2 .2197		**Science Class Size (IV)** N=6123 R^2 .2181	
Family and student background								
Mother education level	*b*	*Se*	*b*	*Se*	b	Se	*b*	*se*
Elementary/middle school	-2.91	(5.09)	-2.79	*(5.20)*	-1.27	(4.87)	-1.98	(4.91)
Secondary school	15.04**	(6.15)	15.65**	*(6.33)*	16.65***	(5.40)	17.39***	(5.72)
2 years of post-secondary school	17.38***	(6.69)	18.10***	*(6.87)*	17.34**	(7.07)	17.16**	(7.43)
University degree or higher	-6.46	(6.84)	-5.62	*(7.17)*	-9.81	(6.59)	-11.26*	(6.83)
No or not finished elementary(omitted)								
Father education level								
Elementary/middle school	13.72**	(6.56)	13.25**	*(6.72)*	12.03**	(5.31)	11.32*	(5.81)
Secondary school	26.31***	(5.97)	25.61***	*(6.11)*	21.85***	(5.69)	21.43***	(5.85)
2 years of post-secondary school	34.97***	(5.40)	34.41***	*(5.41)*	33.81***	(6.60)	33.62***	(6.66)
University degree or higher	10.51	(6.61)	9.51	*(6.68)*	6.05	(6.68)	5.83	(6.86)
Never or not finished elementary(omitted)								
Number of books at your home								
One bookcase	11.28***	(4.28)	11.35**	*(4.40)*	12.19**	(4.81)	13.09**	(5.08)
Two bookcases or more	1.16	(6.27)	1.70	*(6.39)*	-0.83	(6.79)	0.79	(6.96)
No or few books(omitted)								
Both parents Egyptian=1	49.20***	(5.15)	48.95***	*(5.36)*	47.29***	(5.23)	47.18***	(5.33)
Home possession index								
High	34.30***	(4.36)	34.34***	*(4.54)*	35.63***	(5.93)	35.36***	(6.17)
Medium	18.45***	(3.50)	19.15***	*(3.72)*	18.46***	(4.20)	19.00***	(4.36)
Student gender (male =1)	-9.76*	(5.59)	-8.08	*(5.67)*	-16.07***	(5.51)	-15.39***	(5.69)
Testing Lang. spoken at home (always=1)	-18.12***	(3.74)	-18.48***	*(3.93)*	-14.17	(12.10)	-16.56***	(4.38)
Type of community (more than 50000 people = 1)	10.27	(6.54)	9.27	*(6.79)*	13.27*	(7.21)	12.39*	(7.51)
Less than 50000 people (omitted)								
Computer use								
Both at home and school	-22.16***	(4.99)	-21.19***	*(5.13)*	-31.84***	(6.55)	-30.29***	(6.79)
Either home or school	-22.14***	(4.28)	-21.47***	*(4.47)*	-25.94***	(4.48)	-24.85***	(4.70)
Other places or none (omitted)								
PlayStation or similar games yes = 1	-19.69***	(3.09)	-20.19***	*(3.21)*	-14.68***	(3.18)	-14.09***	(3.34)
Teacher characteristics and school resources								
Test language (Arabic=1)	-40.76***	*(12.09)*	-40.61***	*(13.33)*	-17.00***	(4.16)	-18.68	(12.50)
Teacher gender (male = 1)	-0.27	(7.62)	-0.18	*(7.74)*	-2.40	(6.37)	-0.78	(6.58)
Teacher years of experience	1.06***	(0.39)	1.10***	*(0.39)*	-0.17	(0.51)	-0.23	(0.54)
Teaching certificate	7.95	(9.48)	8.89	*(10.09)*	1.04	(7.40)	2.45	(7.57)
Availability of school resources for instruction								
Medium	-2.31	(7.73)	-2.26	*(7.72)*	-0.21	(8.87)	0.51	(9.58)
Low	-16.77	(13.91)	-21.38	*(16.11)*	-14.53	(17.98)	-24.49	(23.51)
Teacher formal education completed								
University	-4.54	(22.71)	-6.31	*(23.81)*	-13.12	(15.99)	-14.28	(16.20)
Postgraduate studies	-14.08	(24.41)	-13.13	*(25.87)*	-22.35	(21.75)	-25.42	(21.40)
Not university (omitted)								
Percentage of disadvantaged std (more than 50%=1)	-6.67	(6.18)	-6.89	*(6.38)*	-11.07*	(5.80)	-12.94**	(6.43)
Class size	-0.51	(0.35)	-0.26	*(0.54)*	-0.38	(0.34)	-0.31	(0.52)
Constant	416.17***	(30.67)	406.88***	*(37.72)*	442.70***	(24.74)	443.79***	(28.62)
Controls for missing included	*Yes*		Yes		*Yes*		*Yes*	

Sampling weights of TIMSS are used, Jackknife standard errors in parentheses, Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Note: Teacher experience square when included all coefficient are essentially the same except teacher experience is insignificant for maths.

Table 3.7: Class size (IV) identification tests

Test	Maths		Science	
	statistic	p-value	statistic	p-value
1) **Underidentification test** (Kleibergen-Paap rk LM statistic)	2095.757	0.0000	2080.747	0.0000
2) **Weak identification test** (Cragg-Donald Wald F statistic)	**3763.350**		**3608.959**	
(Kleibergen-Paap rk Wald F statistic)	**3218.623**		**2561.549**	
Stock-Yogo weak ID test critical values:				
10% maximal IV size 19.93				
15% maximal IV size 11.59				
20% maximal IV size 8.75				
25% maximal IV size 7.25				
3) Hansen J statistic (**over-identification test** of all instruments)	1.456	0.2276	0.728	0.3934

A weak instrument will perform poorly in estimations. The t-stats of the instruments estimates of the first sage indicate highly significant correlations. The test F-statistics is greater than the reported critical value at 10% suggesting a good instrument. The over-identification test fails to reject the null hypothesis of valid instruments. As shown the estimates of IV-class size indicate no different effect though we were not able to control for between school sorting biases.

3.6 Further analysis using interactions

To elaborate on the main findings, a series of interaction terms were used to explore three issues: gender differences, home spoken language, and parents' education and how they vary with respect to other influential factors. Table 3.8 reports significant results for gender interactions (full details in Appendix A-5).

Table 3.8: Family, School Background and Performance differences between boys and girls

DV: Test scores	**Maths**	**n (6582)**	**R^2 .243**		**Science**	**n (6582)**	**R^2 .243**	
Variables	*B*	*se*	*Interaction for a boy*		*b*	*se*	*Interaction for a boy*	
Elementary/middle school mother	13.92*	(7.85)	-18.19**	(8.57)	13.39*	(7.68)	-18.02**	(8.38)
Both parents Egyptian=1	39.87***	(7.35)	16.35**	(8.17)	39.18***	(7.65)	16.20**	(8.08)
Test Language spoken at home (always=1)	-26.52***	(4.67)	16.38**	(6.84)	-28.61***	(5.17)	20.30***	(7.20)
PlayStation or similar games yes = 1	-13.99***	(4.79)	-10.69*	(6.49)	-13.38**	(5.24)	-10.56	(6.97)
Test language (Arabic=1)	-39.88*	(23.29)	-10.60	(26.46)	-35.12**	(17.19)	-15.01	(20.02)
Medium school resources	10.56	(9.82)	-22.27**	(10.87)	12.24	(10.44)	-25.63**	(11.91)
Teacher education University degree	-0.47	(20.23)	-13.00	(20.84)	-34.46**	(14.02)	39.99*	(20.68)
Teacher postgraduate	-22.14	(24.71)	10.02	(26.62)	-59.91***	(16.32)	75.79***	(28.76)
% disadvantaged students (>50%=1)	-17.71**	(8.71)	19.42*	(10.74)	-18.35**	(8.96)	17.99	(11.94)

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

3.6.1 **Gender interactions**

To elaborate on gender differences in student achievement, a dummy variable for being a boy was interacted with each of the other explanatory variables (Table A-3.13). Where gender interactions are significant, this implies there are significant differences between the effects of associated explanatory variables on boys and girls (i.e. if the sample were split by sex, the coefficients would be significantly different). Gender differences between coefficients are significant at the 5% level for mother's education, parents' nationality, home spoken language and school resources (game consoles and the proportion of disadvantaged students in the school are significant at the 10% level). Girls tend to do better if maternal education is at elementary or middle levels, whereas boys do better if both parents are Egyptian. This suggests some preference toward boys from Egyptian parents. Girls who always speak the test language (typically Arabic) at home perform less well by 26 points than other girls, but the corresponding effect on boys is less, reducing test scores by 10 points. Interacting test language and home spoken language conditioned on gender indicates no significant difference between boys and girls. Having video games consoles has a worse effect on boys than on girls. Boys therefore seem more vulnerable to distraction by entertainment games, possibly due to peer effects and the greater freedom given to boys at home.

The impact of a medium level of school resources for maths instruction is significantly different; girls seem to do better when there are more school resources. Students go to schools near to where they live if they cannot afford the cost of transportation to go to a different school. Students who go to a school which has more than 50% of its students coming from disadvantaged families perform significantly different based on their gender. Girls do much worse in such situations, with an 18 point decrease in maths test scores, ceteris paribus. This result might reflect gender bias in poor areas toward boys.

For Science, four significant differences between boys and girls emerged. First, a mother who completed middle school has a significantly larger impact on girls' performance than on boys'. Maternal education at the lowest level has a more

important role in girls' education than boys compared to the highest levels of mother's education. Second, parent's nationality affects boys more than girls: both parents of Egyptian nationality correspond to 16 points in favour of boys. This might suggest a gender bias regarding how much attention Egyptian families give to boys (science and math seen as basics for studying medicine and engineering 'the prestigious degrees). Third, always speaking the test language at home has a significantly more negative effect on girls than on boys. Fourth, the index of school resources availability has more effect on girls. This indicates that more school resources could play a compensating role for the lack of home support for girls learning science.

The teachers' level of formal education has significantly different impacts on the achievement of boys and girls. Teachers with postgraduate education or a university degree are associated with lower girls' performance by 60 and 34 points respectively compared to teachers who have no university education. For boys, the corresponding effects are insignificant. There is no clear explanation for the negative impact of teacher's education on girls' performance or the gap between the impacts on the sexes. The level of education is similar for male and female teachers. Testing for teacher gender effect on boys and girls indicates; a) girls taught by male/female teacher keen to perform better than boys taught by male/female teacher, b) there is no significant effect of teacher gender on girls while boys taught by female teacher do worse than those taught by a male teacher. We have to keep in mind that girls outperform boys on average in maths.

3.6.2 **Parents' Education and high SES**

Parents' education's non-monotonic impact on cognitive achievement requires further investigation. Since the information on parental education was provided by students, one possibility is that it is reporting error which leads to the apparent non-monotonicity. Academically weaker students may exaggerate the education of their parents to make up their bad performance and this 'top level' may not all mean university, leading to a downward bias in its estimated effect. However, the distribution of parents' level of education from TIMSS is similar to the distribution

of population education according to the 2006 population census in Egypt. The only exception is that census data show a lower percentage with postgraduate or equivalent studies.

To investigate further the effect of parents' education we interact parent's education levels with the status of high home possessions index (to proxy high SES). However, one should be careful here in drawing conclusions given the over-representation of postgraduate education in TIMSS. The results in (Table A-3.15) indicate that a student whose mother has a university degree or higher but does not have a high level of home possessions performs significantly worse than a mother with high home possessions. The impact on performance differs significantly for home possessions and the size of difference is 24.8 points of test scores. This means that students whose mother has a university degree or postgraduate degree and has a high level of home possessions perform better by 12 points (25 - 13). We observe the same patterns for father's education.

Before drawing a general conclusion let us look first at the results from the interaction term of father's education with high home possession index. Fathers who completed higher level of education and in high SES affect children's performance more than those in low SES. This result is implied from the significant difference between the two cases. This is to say that parents' education at the highest level [university/PG] should be accompanied by high SES to increase students' performance.

3.6.3 **Parents' education effect and Parental support**

We use measures of parental support as reported by the students' maths teachers. We excluded this measure from the core estimates because of likely endogeneity but explore it here to see if the puzzling negative effect of having highly educated parents' is related to their lack of support for their children's studies. A high parental support increases student test scores on math and science column (1) Table A-3.16. However, the inclusion of parental support variables does not change the non-monotonic effect of parents' education. The parents' level of support is different for different level of education of parents. The share of high supportive

parents who got a post secondary education but not a university degree is more than those with university degree.

Column (2) in Table A-3.16 shows the interaction estimates of father's education with the high level of parental support. The results indicate that there is significant difference for the high level of parental support for highly educated father compared to low level of support. The difference reaches 27 points for maths and 20 point for science achievement. A mother education interaction indicates no significant difference for the highly supportive parents at any level of mother's education. Those results, for parent's education interaction with parental support, indicate that father's support is more important for better achievement than maternal support. In societies where the man has the main earning responsibility better educated fathers may invest more in their children's education. This type of monetary support could be directly related to the phenomenon of private tutoring. The interpretation of parental support here takes the form of the ability to afford the alternative form of education or what is called the shadow education. Similar results apply to science scores column (3) and (4) Table A-3.16 with one difference that medium parental support would work significantly for better achievements for both mother and father.

3.6.4 **Parental education interaction with computer usage**

Social changes are influenced by technological developments. We have looked at how some IT technologies have affected Egyptian students and their families. However, the impact of computing resources could be different across students with different parental backgrounds (i.e. parental education). We explore this by using interaction terms between computer use and parental education. For students whose fathers have a university degree or higher level of education, using computers both at home and at school does not appear to affect their achievement (see Table A-3.17). In general higher parent's education reduces the negative impact of computer use. Similar results apply to science scores. These results go in line with the findings of Malamud and Pop-Eleches (2011) on the home computer use effect on children in Romania.

Parents with higher education have a significant reducing effect on the harm caused by computer usage by Egyptian students. The negative effects of computer usage on test scores were reduced in families with highly educated parents for both maths and science.

3.7 School Effects and school types

Controlling for observable school and teacher characteristics in education production function indicates that school level variables are not so important in explaining the variations in students' achievements. It is the ability to control for unobservable school fixed effects that allows the identification of school effects. The school fixed effects accounts for unobserved differences, i.e. all school level factors that do not vary for students in that school and that affect the learning of students.

3.7.1 **School fixed effects**

We introduce school fixed effects estimation with student and family characteristics. School invariant variables drop out since they are perfectly collinear with school fixed effects. Under this approach, we estimate the pure effect of student and family level variables (SES), by controlling for the unobserved heterogeneity across schools. Dummy variables for each school absorb the effects on students' achievements particular to each school. This model will assess whether some schools are more productive than others, but cannot determine which school qualities matter (Gamoran and Long 2006). This strategy will eliminate all variation between schools. To implement school fixed effects, a vector of dummy variables **Z** for each school is included in model (3.1), leading to equation (3.2)

$$A_{is} = \alpha_0 Z_s + \delta_1 F_{is} + \delta_2 D_{is} + \varepsilon_{is} \qquad \textbf{(3.2)}$$

Where ***A*** is the student's test scores of student *i* in school *s*, **Z** is a vector of dummy variables one for each school and **F** is a vector of family background variables. The coefficient vectors α_0, δ_1 and δ_2 are to be estimated. The **D** vector of dummy variables accounts for missing observations as above and **ε** is the error term. Controlling for school fixed effects should also reduce the effect of student unobserved ability if

students are grouped across schools by similar levels of ability. We first estimate a null model with only fixed effects ($\alpha_0 Z_s$), equation (3.3), to assess the existence and the magnitude of raw differences in student achievement across schools in TIMSS.

$$A_{is} = \alpha_0 Z_s + \varepsilon_{is} \qquad \textbf{(3.3)}$$

Then we move to the main specification in equation (3.2) to check the genuine differences at school level in Egypt. The crucial assumption for consistent estimates is that the school dummies *Z* and the student and family characteristics *F* included in the regression equation are not correlated with the error term. While all school and teacher characteristics *S* will be eliminated.

Using normal estimation techniques will not return consistent estimates since it does not correct for 'alpha inflation' and does not take care of measurement error yielded by plausible values (Wu 2005). The alpha inflation emerges from the correlation of students in the same class; if we do not allow for this clustering effect, the estimates will give lower standard errors. The solution proposed by the TIMSS technical report is to use the jackknife technique to calculate correct standard errors. The use of plausible values as mentioned before yields some measurement error since it based on the Item Response Theory. We employ the five plausible values to correct for measurement error in using IRT and employ jack-knife repeated replication to remove standard error bias. Along with the fact that we are seeking population estimates which require using weights, we included all this in the specification for school fixed effects.

From model (3.1) estimates we obtained a broad picture which shows that the major impacts come from student and family characteristics rather than school level characteristics. The school fixed-effects address the question of how this picture changes once we control for all school level factors including those unobserved.

In the school fixed-effects regression father's education is still more important than mother's. Highly educated mothers reduce maths performance by 12 points compared to mothers without primary education. The non monotonic impact of

parents' education is still evident. Student and family background characteristics appear to be the same in terms of sign and significance but with lower values.

Table 3.9: Estimates of Family, Student and Schools fixed effect on Test scores

DV : Test scores (5 plausible values)	**Maths**		**Science**	
Family and student background	*b*	*se*	*b*	*se*
Mother education level				
Elementary/middle school	-1.383	(4.668)	-0.563	(4.271)
Secondary school	8.361	(6.027)	8.388*	(4.946)
2 years of post secondary school	7.411	(6.473)	5.346	(6.042)
University degree or higher	-12.367*	(6.480)	-17.149***	(5.475)
Father education level				
Elementary/middle school	9.278	(7.053)	7.781	(5.349)
Secondary school	19.981***	(6.263)	15.582***	(5.127)
2 years of post secondary school	27.290***	(5.720)	26.154***	(6.182)
University degree or higher	4.950	(6.043)	0.686	(6.230)
Both parents Egyptian	46.604***	(3.843)	46.288***	(4.493)
Books at home (one bookcase)	7.670*	(4.089)	9.800**	(4.646)
Books at home (two bookcases or more)	3.460	(4.015)	2.107	(4.641)
Home possessions index				
High	22.391***	(4.175)	22.752***	(5.818)
Medium	12.360***	(3.219)	12.181***	(4.276)
Student gender (male =1)	2.758	(4.998)	3.502	(5.509)
Testing spoken at home (always=1)	-12.428***	(3.780)	-11.424***	(3.845)
Computer use				
Both at home and school	-20.010***	(4.500)	-29.546***	(6.342)
Either home or school	-18.025***	(3.962)	-21.953***	(4.610)
PlayStation (yes = 1)	-17.746***	(3.238)	-13.413***	(3.045)
Constant	371.562***	(7.239)	392.628***	(6.520)
Missing obs. Controls	*Yes*		*Yes*	
Adjusted- R- squared	*.3889*		.3739	
N	*6582*		6582	

Jackknife standard errors in parenthesis, Significance levels: * p<0.10, ** p<0.05, *** p<0.01

Finally, having estimated the school fixed effects it is of interest to see what percentage of this measure of 'student's achievement' is explained by the observed characteristics for students and families. Table A-3.18 and A-5.19 show the null model which includes only school dummies panel (4), column (1) estimates without school level variables, column (2) replicates the basic model estimates for comparison, and column (3) gives the school fixed effects estimates. Our controls for students and family background characteristics and school and teacher characteristics explain only about 24% of student's achievements. Column (1) indicates that controls for student and family background only explain 21% of maths achievements and 20% of science. Adding school fixed effects raises the explained variation in 'student achievement' to 39% for maths and 37 for science. School dummies were tested for joint significance and they are jointly highly significant. That finding indicates that there is a large variation in school effects. One possible source of variation might be the difference between different school

types, namely single-sex versus mixed (coeducation) schools and/or Arabic and language schooling. Egypt's TIMSS dataset does not provide information on types of schooling. To overcome this limitation we will use both the gender composition of schools and the test language as proxies for this differentiation.

3.7.2 **Arabic and English schools**

Egypt performed TIMSS in two languages: Arabic and English. English test takers would typically attend language schools and the rest of students attend Arabic schools. TIMSS sampled private and public schools but provided no information to classify the schools. Students who took the English TIMSS test performed significantly better than those who took the Arabic version of the test (Table 3.10). The TIMSS test questions can be categorised into three cognitive domains measuring student's performance in terms of Knowing, Applying and Reasoning for each subject. We tested for the mean differences in each domain between the two samples of students (Arabic and English test language). Taking the test in English could be a proxy for higher SES and for school choice as students who take exam in English, presumably, come from higher status family backgrounds with support at many levels (attending language schools, receiving more home resources and private tutoring).

The mean test scores of students who always speak the test language at home - either Arabic or English - is significantly lower than for students who do not always speak the test language at home (Table A-3.20).

Table 3.10: Test scores means for Maths and Science cognitive domains by test language

Subject		**Maths**	**Maths cognitive domains scores**			**Science**	**Science cognitive domains scores**		
Sample *Mean/se*		**Total**	**Knowing**	**Applying**	**Reasoning**	**Total**	**Knowing**	**Applying**	**Reasoning**
Full **N=6582**		390.56 (3.57)	393.28 (3.58)	392.10 (3.61)	396.50 (3.38)	408.24 (3.56)	403.80 (3.56)	434.03 (3.85)	395.44 (3.36)
Arabic (A) **N=5462**		388.01 (3.70)	390.79 (3.75)	389.41 (3.78)	394.27 (3.52)	406.51 (3.68)	402.00 (3.65)	432.64 (4.00)	393.68 (3.41)
English (E) **N=1120**		481.98 (6.35)	482.54 (6.02)	488.29 (8.20)	476.39 (5.820	470.21 (7.49)	468.41 (7.80)	483.96 (10.48)	458.34 (10.77)
T-test	***Dif***	-93.97	-91.75	-98.88	-82.12	-63.69	-66.41	-51.32	-64.66
	Sig	***	***	***	***	***	***	***	***
	(se)	(7.53)	(7.54)	(9.56)	(6.94)	(8.33)	(8.18)	(11.64)	(10.50)

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt. .s.e in parenthesis

T-test for means equality of Arabic and English groups, Dif. Indicates the difference, Sig is the significant

However, introducing interaction terms for how frequently the test languages are spoken at home and natives with test language shows no significant difference between Arabic and English test takers. These findings suggest that the difference is a matter of SES; it is neither home practice nor nationality as it appears from simple comparisons.

The test language interacted with the index of home possessions – a proxy for SES – allows us to see whether the effect of the test language is different depending on the student's SES (Table A-3.21). The results show a statistically significant relation between the SES and the test language. High SES background reduces the negative effect of being tested in Arabic. This is in line with the findings on parental support and parental education above. These findings support the assumption made in the main results section that students who took the English test are coming from high income families and this increases their scores. However this finding raises the issue of the endogeneity of school choice. We will return to this issue in the next sub-section, which describes estimates obtained from separate samples for the testing language (to capture the two school type's effects).

3.7.2.1 Splitting sample using test language

Students who took the English version of TIMSS most probably attended language school while the others, who took the Arabic test, attended Arabic schools (private or public). Descriptive statistics show that of 5462 students that took the test in Arabic only 13% have high SES. By contrast, two thirds of the 1120 students tested in English had high SES. Re-estimating the basic model on separate samples, Table 3.11 presents the results for language schools and Arabic schools in terms of population (weighted) estimates as presented in Chapter 2. Regarding SES and school choice, the findings indicate that the home possessions index has a highly significant effect on student achievements in Arabic schools for maths and science. For English language test takers the effect of SES is insignificant for both maths and science. Not just this but SES is negative, it could be home possessions index not discriminating at higher end or sample selection issue (only smart poor go to

language schools). For students that took the test in Arabic, scores are significantly higher for those with high SES.

Table 3.11: Splitting TIMSS sample by test language

DV : Test scores(PVs)	Maths				Science			
Family and student background	English		Arabic		English		Arabic	
Mother education level	*b*	*se*	*b*	*se*	*b*	*se*	*b*	*se*
Elementary/middle school	-18.914	(59.977)	-3.104	(5.102)	43.516	(141.108)	-1.272	(4.926)
Secondary school	-6.063	(62.366)	14.440**	(6.240)	32.693	(111.973)	16.550***	(5.583)
2 years of post secondary school	-20.907	(55.128)	19.293***	(6.840)	28.632	(107.381)	19.429***	(7.388)
University degree or higher	-26.795	(59.968)	-8.175	(7.207)	18.674	(108.446)	-11.466*	(6.750)
Father education level								
Elementary/middle school	-2.043	(29.639)	13.489**	(6.595)	56.753	(70.908)	11.590**	(5.329)
Secondary school	1.722	(48.385)	26.451***	(6.083)	62.126	(93.864)	21.802***	(5.713)
2 years of post secondary school	20.486	(24.633)	36.358***	(5.539)	83.055	(66.418)	34.760***	(6.707)
University degree or higher	24.890	(25.880)	8.493	(6.832)	87.730	(68.196)	3.700	(6.874)
Both parents Egyptian=1	22.612***	(8.244)	50.761***	(4.947)	22.137*	(13.056)	48.267***	(4.967)
one book case	17.637***	(6.086)	11.177**	(4.413)	16.198**	(6.960)	12.036**	(4.911)
Two book cases	14.936***	(5.286)	0.841	(6.442)	14.625**	(6.477)	-1.684	(6.994)
Home possession index								
High	-19.623	(18.229)	36.265***	(4.589)	-31.879	(29.672)	37.467***	(6.132)
Medium	-21.912	(20.136)	18.374***	(3.591)	-26.281	(22.132)	18.240***	(4.240)
Boy student	16.737*	(9.900)	-9.729*	(5.565)	2.700	(12.995)	-17.209***	(5.597)
Testing lang. spoken at home (always=1)	-14.333*	(8.535)	-17.613***	(3.806)	-14.514	(9.751)	-16.818***	(4.256)
computer use								
Both at home and school	36.574**	(17.783)	-22.573***	(5.050)	17.081	(24.639)	-32.058***	(6.649)
Either home or school	26.755**	(13.452)	-22.249***	(4.282)	13.130	(17.647)	-25.668***	(4.566)
PlayStation or similar game yes = 1	-15.940**	(6.483)	-19.676***	(3.136)	-14.344**	(6.601)	-14.573***	(3.286)
Teacher characteristics and school resources								
Teacher gender (male = 1)	-6.777	(16.619)	-0.598	(7.793)	1.342	(13.341)	-2.034	(6.459)
Teacher years of experience	0.008	(0.910)	1.102***	(0.405)	-1.424	(2.968)	-0.210	(0.530)
Teaching certificate	1.976	(17.653)	8.402	(9.650)	-25.179	(17.214)	1.398	(7.519)
Availability of school resources								
Medium	-24.227**	(9.701)	-1.864	(7.785)	-36.134**	(18.307)	-0.104	(8.960)
Low	-8.795	(22.848)	-18.159	(14.145)	-13.015	(24.597)	-15.366	(17.566)
Teacher formal education								
University	17.025	(64.303)	-5.995	(23.002)	-10.509	(36.605)	-13.941	(16.228)
Postgraduate studies	0.000	(57.912)	-13.536	(24.780)	-2.225	(26.527)	-24.749	(22.327)
Type of community (>50000 = 1)	-2.927	(16.750)	9.568	(6.565)	-2.827	(10.692)	13.015*	(7.262)
% disadvantaged std (> 50%=1)	-8.822	(16.054)	-6.773	(6.293)	-16.877	(24.318)	-11.660**	(5.827)
class size (more than 41 =1)	8.561	(19.751)	-5.828	(6.608)	-1.316	(22.356)	-5.714	(6.753)
Constant	439.443***	(86.048)	358.361***	(27.205)	418.940***	(101.515)	417.234***	(22.690)
Controls for missing included	*Yes*		*Yes*		*Yes*		*Yes*	
Adjusted- R^2	*.21479*		*.23055*		*.19467*		*.21623*	
N	*1120*		*5462*		*1120*		*5462*	

Jackknife standard errors in parenthesis, Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Parents' education is not significant for students tested in English. For students tested in Arabic father's education matters more than mother's education with each

level of paternal education below university raising performance. Only maternal education at the middle level (secondary or post secondary) significantly raises student achievement.

In general, the Arabic schools results are the same as the full sample. Native parents affect scores for students tested in Arabic much more than if tested in English. The size of the effect of Egyptian parents on their children's achievements in Arabic schools is twice the effect for those in language schools. Having one or two bookcases at home increases test scores for students in language schools. Language education might stress more on reading, making the presence of books in the home more important.

The gender effect is different in size and direction between the two types; boys outperform girls in language schools but girls do better in Arabic schools. Computer usage has positive significant effect in language schools. This effect is only for maths, the effect on science in insignificant. Computer use has a highly significant negative impact on maths and science in Arabic schools which seems to dominate in the full model estimation. Play-Station has negative effect on both types of schools for maths and science. Medium school resources reduce achievement in language schools compared to high level of resources. Teacher's experience matters only in Arabic schools with very small effect.

3.7.2.2 Test language different effect on maths and science achievements

Table 3.10 shows that the means are significantly different for all three cognitive domains and for the total test scores for both maths and science. The least statistically significant difference and the highest standard errors are in the cognitive domain of applying in the science test. Figure A-3.1 clearly shows that there are differences in the test scores distributions as well as the superiority of the English language takers for maths. The picture is not so clear for the science (Figure A-3.2) distributions for cognitive domains, but still indicates higher test scores distributions for the English language students.

Estimates of student, family and school impact on test scores show a highly significant effect of English as the test language on maths test scores for each of the

cognitive domains (Table A-3.22). Given the better performance of students in English language schools, it is expected to have the same performance in science. The striking result is that English schools students are indifferent from their peers in Arabic schools in science achievement. The test language has an insignificant effect on science test scores. For the cognitive domains of knowing and reasoning for science, the effects of English are statistically significant at the 10% level. To understand why language schools do not seem to have an advantage in the applying science domain, we investigated the science curriculum questionnaire which contains the responses provided by the National Research Coordinators of the participating countries to the TIMSS 2007.

Egypt's science curriculum questionnaire states that the national science curriculum places a lot of emphasis on knowing basic facts and principles, with some emphasis on providing explanations to what is being studied and to link up what students are learning to their daily life. Unfortunately, very little emphasis is placed on observing natural phenomena and describing what is seen, designing and planning experiments or investigations, conducting experiments or investigations, and integrating science with other subjects. The nature of the science curricula does not encourage understanding the application of science, and this may be why scores in the applying science domain is not influenced by the type of school (or testing language).

These findings shed light on some reasons for the frequently stated problem of mismatch between the graduate acquired skills and the required skills of the labour market especially technical and practical skills. There is little provision for the application of subjects learnt in school especially science. As we have argued, this problem stems from the poor nature of the curricula and hence there need for a reform in the science curricula.

3.7.2.3 Test language and home spoken language

One curious finding was that students who always speak the test language at home perform worse, *ceteris paribus*, than others. We use the sub-samples split by test language to see if this finding holds true for both those tested in Arabic and those

tested in English. We find that the overall finding is driven by the results for students tested in Arabic, who perform significantly worse in maths and science if they always speak Arabic at home (compared to sometimes or never). The effects of speaking the test language at home on test scores are weaker or insignificant for those tested in English (Table 3.11).

We can only speculate on why always speaking the test language at home is associated with lower test scores, particularly if tested in Arabic. The most plausible explanation is that it is related to (lower) SES. For those tested in Arabic a possibility is that households in which a language other than Arabic is spoken (sometimes) at home are higher income and/or have motivated immigrant parents. For those tested in English, it may be that only Egyptian (Arabic speaking) students from high income families go to language schools. However, as was said, there is not enough information to support those explanations - they need further investigations either by studies on instruction language or on teaching and evaluation methods in Egypt.

3.7.3 **Schools type by sex composition**

There is a profound debate on single-sex schools versus coeducation in empirical research. One side supports single sex schools, especially for girls. The empirical evidence, however, indicates mixed findings to support this claim. For example, Lee et.al (1990) claimed that single sex schools improve girls' performance in maths in Nigeria. Recent reviews though criticized those findings for sample selection bias with teachers' gender in their study. Eisenkopf et.al (2011) natural experiment analysis on upper-secondary school in Switzerland shows positive effect of single-sex education on the maths achievements but not in German. Nonetheless, empirical evidence generally shows it less likely for girls to do better than boys in mixed schools, specifically in science (Carpenter and Hayden 1987).

The Egyptian education system tends to be single-sex education system after the primary stage. The sample consists of 6582 students in 233 Egyptian 8th grade classes. The TIMSS design sampled a single class in each school, 79 of them mixed and 154 single-sex classes. Of the sample, 34% are boys in boys' school, 34% are

girls in girls' school, 17% are boys in mixed school and 15% are girls in mixed school.

Average test scores for maths and science are higher in single-sex schools. The mean gaps are statistically significant 18 and 17 points in maths and science respectively.

Table 3.12: number of students and schools in the TIMSS sample by school type

Type of school	Number of schools	Percent of total school	Number of students	Maths test scores	Science test scores
Mixed schools	79	32	2084	**379**	**396**
Girls	-	31	997	377	395
Boys	-	33	1087	381	397
Single-sex schools	154	68	4498	**396**	**414**
Girls	74	69	2261	410	429
Boys	80	67	2237	385	398
Total	233	100	6582	**391**	**408**
Test scores gap for girls between mixed and single sex schools				33***	34***
Test scores gap for boys between mixed and single sex schools				4	1

Disaggregating by gender, girls who go to single-sex schools outperform those who go to mixed school but boys' performance is not statistically significantly different between the school types. The results of the education production function across school-type are presented in Table A-3.25 and Table A-3.27 for maths and science respectively. Students who attend a single-sex school exhibit more differences in achievement compared to co-educational school. Girls who attend a single-sex school outperform boys in similar schools by 18 points in maths and 26 points in science. Teachers' gender has no effect on academic performance either in single-sex or in mixed school.

Do the educational production functions for boys and girls differ in different types of schools? To answer this question we estimated our model on four subsamples split by gender school type in Table 3.13 and Table 3.14. Factors influencing students' achievement in mixed schools are fewer than those of single sex schools, and signs vary. Computer usage affects performance negatively except for boys in mixed schools. Teacher experience increases the performance only in boys' schools. Teaching certificate and teacher's university degree have contradictory effects on girls' performance.

Table 3.13: Effects of Attending Single-Sex vs. Co-education Schools for Boys and Girls (maths)

DV: maths test scores	Boys' schools		Boys in mixed schools		Girls' schools		Girls in mixed schools	
Average maths scores	385		382		408		376	
VARIABLES	B	se	b	se	B	se	b	se
Parents education Upper-sec	28.25**	(11.27)	35.96**	(14.08)	8.74	(8.28)	16.74	(20.61)
One bookcases	15.05**	(6.64)	11.56	(12.31)	7.84*	(4.50)	4.12	(15.61)
Test language Arabic	-83.45**	(35.47)	-22.77	(23.85)	-65.82**	(26.46)	-15.10	(23.58)
Test Language Spoken always	-12.19*	(6.79)	-6.70	(6.94)	-21.63***	(5.43)	-26.23**	(10.37)
PC at H&SCL	-32.63***	(7.03)	-10.05	(15.23)	-21.83**	(9.37)	-27.76*	(16.63)
PC at H/SCL	-29.38***	(6.16)	-8.50	(12.95)	-18.77***	(7.14)	-25.08*	(13.35)
Teacher Experience	1.97***	(0.73)	-0.18	(2.07)	0.40	(0.45)	0.36	(1.76)
Teaching Certificate	-6.19	(16.50)	32.33*	(16.58)	-26.17**	(12.68)	7.63	(16.06)
Medium SCL Resources	-18.68**	(7.89)	-0.23	(33.89)	14.17	(12.52)	7.44	(29.18)
Teacher has University Degree	0.00	(75.17)	0.00	(164.6)	44.41**	(20.30)	-46.09	(140.17)
Poverty 50% Disadvantaged	-1.25	(9.29)	-6.55	(27.76)	-31.17***	(11.54)	-1.60	(18.33)
Constant	370.65***	(107.48)	412.86***	(160.0)	464.89***	(112.71)	442.89**	(193.41)
Observations	2237		1087		2261		997	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Table 3.14: Effects of Attending Single-Sex vs. Co-education Schools for Boys and Girls (science)

DV: science test scores	Boys' schools		Boys in mixed schools		Girls' schools		Girls in mixed schools	
Average science scores	400		399		428		393	
VARIABLES	B	se	b	se	B	se	b	se
Parents education Upper-sec	27.65***	(8.70)	29.09*	(15.58)	5.25	(9.73)	13.90	(15.83)
Post-sec not UNI	37.19***	(9.54)	27.46	(19.28)	23.19**	(9.81)	26.90*	(15.92)
Natives	51.25***	(6.42)	64.51***	(8.37)	33.39***	(8.66)	54.03***	(13.15)
One bookcases	14.59**	(6.87)	16.52	(10.60)	13.03**	(5.93)	8.72	(14.54)
Home possess Medium	18.19***	(5.68)	3.02	(13.16)	18.28***	(5.59)	9.03	(9.38)
Test language spoken Always	-10.74	(7.54)	1.27	(8.99)	-21.15***	(5.40)	-26.64**	(11.92)
PC at H&SCL	-39.24***	(8.54)	-13.98	(17.85)	-23.27**	(10.44)	-36.63**	(15.48)
PC at H/SCL	-31.80***	(6.51)	-8.39	(15.12)	-19.63**	(8.03)	-21.98**	(10.14)
School Resources Medium	-24.34**	(11.48)	1.71	(46.67)	25.49	(15.77)	-5.75	(31.96)
Urban community population>50000	20.68*	(10.92)	13.79	(27.95)	4.08	(12.64)	14.54	(19.58)
Poverty 50% Disadvantaged	-10.16	(12.45)	-2.05	(24.46)	-33.70***	(8.97)	-23.83	(15.17)
Constant	477.42***	(54.96)	425.59***	(55.92)	474.21***	(38.95)	483.09***	(50.45)
Observations	2237		1087		2261		997	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Medium school resources reduce students' performance in boys' schools. Girls' schools located in a socially disadvantaged area have lower maths test scores by 31 points. The number of books at home significantly increases student achievements only in single-sex schools. The effect of number of books for boys is almost twice that for girls for maths.

The same findings hold for students' performance in science, except for test language which is not more significant on the gender-school type disaggregation. Teacher's factors have no effect on performance in science. A larger community increases boys' science performance in boys' schools. In general, it seems that mixed schools have a different production function than single sex schools.

3.8 Extensions

Finally we test for parents and students attitudes using measures of the level of parental support and student motivation. The level of parental support has a clear impact on performance (Table A-3.23). An increase of parental support from medium to higher levels doubles the effect on test scores (from 15 to 31 point) compared to low levels of parental support. Students with higher educational aspiration perform significantly better compared to students with lower aspiration. Students were asked "How far do you expect to go in school?" Students who expect to go to university or postgraduate studies perform significantly better (by 23 points) compared to students with less expectations (only to complete secondary or middle school education or at most two years post secondary education). The coefficients on other variables are unaffected except that the effect of mothers with university education becomes significant and negative (by 14 points in math) compared to a mother with no education or did not complete primary school. Science estimates indicate the same patterns of effects for parental support and students' aspiration.

3.8.1 **Testing for accountability and autonomy**

The literature on economics of education describes and discusses different types of reform and their effects. From input based reform to incentive and accountability

based reform, many studies address this issue and try to focus on the effectiveness and efficiency of such reforms (Hanushek 2003; Pritchett and Filmer 1999; Woessmann 2003a). Accountability is measured by whether data about schools are publicly available and whether parents have a say over the schools affairs. School autonomy involves pedagogical autonomy, facing competition, and freedom to hire and fire besides decentralization of education system. It is difficult to address these issues for Egypt as data on accountability and school autonomy is very limited. School competition and freedom to hire and fire are only applicable for private schools which represent a small percentage of education services suppliers.

TIMSS does ask for information on parental involvement in school activities, although there is no indication of how effective this is. Pedagogical autonomy is measured in TIMSS by asking teachers whether they participated in professional development in subject pedagogy in the past two years. We use these two variables in Table A-3.24: pedagogical autonomy appears to have no effect whereas parental involvement in school activity has a significant effect on student performance medium, low and very low levels of involvement are associated with lower test scores than high level of involvement.

3.9 Conclusions

The aim of this chapter was to estimate the determinants of educational outcomes of the Egyptian students. Using cross-section data from TIMSS 2007 to estimate a reduced form education production function, the nature of the data requires working with plausible values and employing the jackknife technique to calculate the correct standard errors. These issues were all addressed before proceeding with econometric analysis (Chapter 2). This chapter estimates an educational production for Egypt to determine the influence of family background and school inputs on 8th grade students' performance in the TIMSS achievement tests for maths and science.

A simple set of conclusions could be drawn from this analysis for 1) students' characteristics and home background, 2) teachers characteristics and school resources. The impact of parental education on students' cognitive skills is strong but appears non monotonic. For example, with father's education both the highest

and lowest levels reduce performance relative to intermediate levels. Given the non monotonic effect of parents' education we explored some interactions with different proxies for SES and assets. The estimates suggest that higher home possessions are always associated with significant positive effects on achievements.

The results suggest that socio-economic variables (SES) are more important than school level variables, although not always in the anticipated way. Number of books at home is found to increase achievements when above few, i.e. for one bookcase compared to no, but there is no additional effect of even more bookcases. These results go against the findings of Ammermuller et.al.(2005) which suggest an increasing effect with more books at home in Europe. A likely explanation is that beyond few books the measure is very imprecise. School and teaching practices place too much emphasis on 'spoon feeding' with little encouragement for self-learning through wider reading or going to libraries, so having many books at home may confer no clear benefit.

School fixed effects do show variation, but this is mainly due to unobserved factors rather than measured teacher characteristics or school resources. There were two main suspected effects related to school types through gender composition and the test language. Our research found a significant link between school type and student performance in Egypt; first, language schools appear to have better scores than Arabic schools. Second, single-sex schools do better than mixed schools (especially for girls).

Students tested in English (who presumably attend a language school) outperformed students tested in Arabic suggesting that Language schools outperform Arabic schools. The test language effect turns to have no impact on science achievement. Splitting TIMSS sample based on test language into Arabic and 'English' schools changed the results dramatically indicating two different production functions. The coefficients' effects for most of the variables differ between Arabic and English language schools. The different effects pattern are similar for math and science for each type of schools except for the effect of urban

community which increases science test scores and schools placed in disadvantaged areas which reduces student achievement in science of Arabic schools' students.

Single-sex schools work better than mixed schools especially for girls. Furthermore, single-sex language schools are more effective than Arabic single sex schools. This confirms the dominance of the language schools and is as well related to the style and social-economic status of enrolled students. Those findings should be taken with careful interpretations. The school selectivity issue is a valid point in this context; one should expect higher SES and higher education for those who enrolled in the language schools. However, controlling for SES implies significant effect in Arabic school but not in language schools.

The other general finding is that school observed variables have ambiguous effects on test scores, consistent with the common finding in the literature (Glewwe and Kremer 2006; Hanushek 1995) that the evidence about observable school inputs influence on school quality is not precise. Unlike maths estimates, community type and school location have significant effects on science achievements. Living in a highly populated area (presumably urban community) has a positive significant impact on achievements. Schools which have more than 50% of the students come from disadvantaged homes exhibit lower student performance while urban communities and rich areas have positive effect on science achievements. Those findings could have some policy implications regarding giving more attention to schools in poor areas and investigating further on the possible reasons behind such effects.

Appendix A-5: Descriptive statistics and further estimations

Table A-3.1: Basic statistics on selected characteristics for Egypt

Poverty and Social Status in 2007	Egypt	Middle East& North Africa	Lower middle-income countries
Population, mid-year (millions)	75.5	313	3,437
GNI per capita (Atlas method, US$)	1,580	2,794	1,887
GNI (Atlas method, US$ billions)	119.5	876	6,485
Average annual growth, 2001-07			
Population (%)	1.8	1.8	1.1
Labor force (%)	2.8	3.6	1.5
Most recent estimate (latest year available, 2001-07)			
Poverty (% of population below national poverty line)	..	..	..
Urban population (% of total population)	43	57	42
Life expectancy at birth (years)	71	70	69
Infant mortality (per 1,000 live births)	29	34	41
Child malnutrition (% of children under 5)	5	..	25
Access to an improved water source (% of population)	98	89	88
Literacy (% of population age 15+)	71	73	89
Gross primary enrolment (% of school-age population)	105	105	111
Male	107	108	112
Female	102	103	109

Source: World Bank, Egypt, Arab Rep. at a glance. This table was produced from the Development Economics LDB database.
Note: 2007 data are preliminary estimates.

Table A-3.2: Basic statistics on education, Egypt and MENA 2007

	MENA	*Egypt*
Gross enrolment rate (%), pre-primary, total	20.86	17.24
Net enrolment rate (%), primary level, total	90.45	95.75
Net enrolment rate (%), secondary, total	66.7	..
Gross enrolment rate (%), tertiary, total	25.89	34.75
Gender parity index (GPI), gross enrolment ratio in primary education	0.96	0.95
Gross intake rate to grade 1, total	..	103.33
Drop-out rate (%), primary	..	3.17
Percentage of repeaters (%), primary	6.53	3.10
Out-of-school children, primary, total	3060056	231884
Primary completion rate, total	91.12	98.45
Percentage of repeaters (%), secondary	..	7.3
Primary education, teachers (% trained)	..	..
Secondary education, teachers (% trained)	..	..
Pupil-teacher ratio, primary	22.05	27.08
Pupil-teacher ratio, secondary	18.66	17.08
Public education expenditure as % of GDP	..	3.75

Source: World Bank, EdStats

Table A-3.3: Access, Coverage and Efficiency of education in Egypt

	Total	*Male*	*Female*
Gross Intake in Grade 1 (%)	103	105	102
Primary Gross Enrolment Ratio (%) (6 years)	105	108	102
Primary Repeaters (% of primary cohort)	3.1	3.9	2.2
Primary Drop Out Rate (%)	5	6	4
Primary Completion Rate (%)	99	101	96
Expected Primary Completion Rate (%)	98	99	97
Number of Primary Age Children Out of School (thousands)	232	10	222
Primary Gender Parity Index (GER ratio)[19]	0.95		
Secondary Gross Enrolment Ratio (%) (6 years)	88	91	85
Lower Secondary (%) (3 years)	98	102	95
Upper Secondary (%) (3 years)	77	79	75
Vocational and Technical (% of secondary enrolment)	30.3	0.3	0.3
Secondary Gender Parity Index (GER ratio)a	0.94	..	..

Sources: UNESCO Institute for Statistics (UIS), World Bank, UNAIDS, ILO, Household Surveys, IMF, Country. Data are for the most recent year available in 2000-2005.

[19] Gender Parity Index (GPI) refers to the ratio of the female to male gross enrolment ratios. A GPI of 1 indicates parity between sexes.

Table A-3.4: Average maths and science scale scores of Egypt and some selected countries

COUNTRY	*N of students*	*Maths (Mean)*	*(s.e.)*	*COUNTRY*	*N of students*	*Science (Mean)*	*(s.e.)*
Japan	4312	569.81	(2.41)	**Japan**	5524	553.82	(1.9)
England	4025	513.4	(4.82)	**England**	4048	541.5	(4.48)
United States	7377	508.45	(2.83)	**United States**	7593	519.99	(2.86)
Spain (Basque country)	2296	498.56	(2.99)	**Spain (Basque Country)**	2323	497.71	(2.96)
Italy	4408	479.63	(3.04)	**Italy**	4408	495.15	(2.82)
Malaysia	4466	473.89	(5.03)	**United Arab Emirates (Dubai)**	3315	488.87	(2.76)
Norway	4627	469.22	(1.98)	**Norway**	4743	486.76	(2.19)
Israel	3294	463.25	(3.95)	**Jordan**	5251	481.72	(3.96)
United Arab Emirates (Dubai)	3195	460.62	(2.37)	**Malaysia**	4466	470.8	(6.03)
Lebanon	3786	449.06	(3.98)	**Israel**	3416	467.87	(4.34)
Turkey	4498	431.81	(4.75)	**Bahrain**	4247	467.45	(1.72)
Jordan	5251	426.89	(4.12)	**Iran**	3981	458.93	(3.59)
Tunisia	4080	420.41	(2.43)	**Turkey**	4498	454.16	(3.71)
Iran, Islamic Republic of	3981	403.38	(4.12)	**Syria, Arab Republic of**	4770	451.98	(2.89)
Bahrain	4230	398.07	(1.57)	**Tunisia**	4080	444.9	(2.12)
Indonesia	4203	397.11	(3.81)	**Indonesia**	4203	426.99	(3.37)
Syria, Arab Republic of	4650	394.84	(3.76)	**Oman**	4752	422.5	(2.96)
Egypt	6582	390.56	(3.57)	**Kuwait**	4091	417.96	(2.82)
Algeria	5447	386.75	(2.14)	**Lebanon**	3786	413.61	(5.93)
Morocco	3060	380.78	(2.97)	**Egypt**	6582	408.24	(3.56)
Oman	4752	372.43	(3.37)	**Algeria**	5447	408.06	(1.74)
Palestinian National Authority	4378	367.15	(3.55)	**Palestinian National Authority**	4378	404.13	(3.5)
Botswana	4208	363.54	(2.27)	**Saudi Arabia**	4269	403.25	(2.45)
Kuwait	4091	353.67	(2.32)	**Morocco**	3079	401.83	(2.9)
Saudi Arabia	4243	329.34	(2.85)	**Botswana**	4208	354.53	(3.05)
Ghana	5294	309.37	(4.36)	**Qatar**	7377	318.85	(1.73)
Qatar	7184	306.79	(1.37)	**Ghana**	5508	303.27	(5.36)

Table A-3.5: T-test of gender differences in test scores for TIMSS in Egypt

		Maths			Science		
Group	**Obs.**	**Mean**	**Std. Err.**	**Std. Dev.**	**Mean**	**Std. Err.**	**Std. Dev.**
				2007			
Girls	3258	397.26	1.71	97.86	416.80	1.70	96.95
Boys	3324	383.98	1.77	102.12	399.86	1.75	101.02
diff		13.27	2.50		16.94	2.44	
t-stats		**5.38**			**6.94**		
				2003			
Girls	3118	406.32	1.60	89.14	421.62	1.79	99.74
Boys	3534	405.50	1.60	94.93	420.54	1.79	106.65
diff		0.83	2.27		1.08	2.54	
t-stats		**0.36**			**0.42**		
				2003 vs. 2007			
2003	6652	405.89	1.13	92.26	421.05	1.27	103.46
2007	6582	390.56	1.25	101.80	408.25	1.22	99.38
diff		15.33	1.69		12.80	1.76	
t-stats		**9.077**			**7.26**		

Table A-3.6: Percentage of students at each benchmark by gender

		Maths		Science	
	Performance group	**N of cases**	**Percent**	**N of cases**	**Percent**
Girls	Below 400	1389	50	1182	42
	From 400 to 475	922	27	964	29
	From 475 to 550	673	17	766	21
	From 550 to 625	243	5	314	8
	Above 625	31	1	31	1
Boys	Below 400	1616	56	1447	49
	From 400 to 475	827	25	891	26
	From 475 to 550	605	15	679	18
	From 550 to 625	232	4	269	6
	Above 625	45	1	38	1
Total	Below 400	3005	53	2629	45
	From 400 to 475	1748	26	1855	28
	From 475 to 550	1278	16	1445	19
	From 550 to 625	475	5	584	7
	Above 625	76	1	69	1

Table A-3.7: Teachers age, percentages of students and average scores

Age of teacher	Maths				Science			
	Freq.	Percent	mean	se	Freq.	Percent	Mean	se
under 25	84	1.82	327.8	26.09	104	1.9	410.43	10.41
25 to 29	444	7.87	358.23	17.38	974	18.35	406.34	7.92
30 to 39	2989	52.35	391.28	5.61	2573	39.16	397.66	6.85
40 to 49	2116	33.83	396.13	6.21	2718	38.34	418.4	5.74
50 to 59	321	4.05	432.12	16.01	67	2.25	409.96	29.12
60 or older	38	0.07	533.06	5.18				

Table A-3.8: Teachers job satisfaction, by average test scores and students percentages

Job satisfaction	Maths				science			
	Freq.	Percent	mean	se	Freq.	Percent	mean	se
very high	1787	25.18	394.53	7.15	1758	25.7	422.84	6.36
high	2099	33.53	394.66	6.58	2606	40.19	408.87	5.46
medium	2165	34.67	388.06	6.5	1753	29.02	396.15	8.65
low	331	4.35	372.35	20	236	3.06	389.65	19.64
very low	105	2.27	357.84	34.19	125	2.02	391.16	26.92

Table A-3.9: Class size, percentages of students and average test scores

Class size	Maths				science			
	Freq.	Percent	mean	se	Freq.	Percent	mean	se
1 to 24	328	4.02	410.04	12.8	273	3.98	419.52	13.63
25 to 40	3067	53.18	394.72	4.93	3007	53.21	411.37	5.2
41 or more	2981	42.8	386.05	5.59	3027	42.81	404.15	5.42

Table A-3.10: Percent of Economic Disadvantage Students and Maths scale scores in Egypt

Students economic background (% disadvantaged)	Maths				science			
	Freq.	Percent	mean	se	Freq.	Percent	mean	se
Below 10 %	1148	10.47	416.71	17.44	1148	10.47	430.39	15.93
11 to 25%	735	11.07	399.37	11.31	735	11.07	418.58	11.6
26 to 50%	1130	23.73	390.87	5.52	1130	23.73	410.55	6.17
More than 50%	2757	54.73	379.82	4.76	2757	54.73	397.93	4.77

Table A-3.11: Allocation of school sample in Egypt- eighth grade

Explicit Stratum	Total sampled schools	Ineligible Schools	Participating Schools			Non-Participating Sampled Schools
			Sampled Schools	1st Replacement	2st Replacement	
Public – Cairo	18	0	18	0	0	0
Public – Alexandria	22	0	22	0	0	0
Public – All other regions	120	0	119	1	0	0
Experimental Language	25	0	25	0	0	0
Free Private	2	0	2	0	0	0
Private	25	0	24	1	0	0
Private Language	25	4	21	0	0	0
Total	237	4	231	2	0	0

Source: TIMSS 2007 Technical Report, p 374.

Table A-3.12: Estimated effect of computer usage four categories (maths)

VARIABLES	b	se
Pc both at home and at school	-30.13***	(6.13)
Pc at home but not at school	-31.44***	(5.95)
Pc at school but not at home	-24.57***	(5.67)
Pc only at other places	-4.71	(6.78)
Lower-sec EDC	7.64	(5.97)
Upper-sec	23.65***	(6.51)
Post-sec not UNI	34.80***	(6.99)
University degree	4.02	(6.86)
Natives	48.48***	(5.28)
One bookcases	10.68**	(4.36)
Two bookcases	2.14	(6.37)
Home possess H	61.15***	(5.43)
Home possess M	41.58***	(4.80)
Boy student	-10.08*	(5.44)
TL spoken ALs	-20.27***	(3.77)
Male teacher	1.88	(7.59)
T. Experience	1.02***	(0.36)
T. Certificate	8.45	(9.48)
M SCL RCS	-5.07	(7.13)
L SCL RSC	-22.72	(14.23)
T. UNI Degree	0.29	(21.28)
COMMU.>50000	10.77	(6.72)
Pov 50% Disadv	-9.34	(5.93)
Class size	-0.71	(1.35)
Class size Sqr	0.00	(0.02)
Constant	352.23***	(32.43)

Table A-3.13: Family, School Background and Performance differences between boys and girls

DV: Test scores	Maths	n (6582)	R^2 .243		Science	n (6582)	R^2 .243	
Variables	*B*	*se*	*Interaction for a boy*		*b*	*Se*	*Interaction for a boy*	
Mother education level								
No or not finished elementary	11.44	(9.9)	-9.59	(12.41)	10.03	(9.88)	-9.75	(12.32)
Elementary/middle school	13.92*	(7.85)	-18.19**	(8.57)	13.39*	(7.68)	-18.02**	(8.38)
Secondary school	28.24***	(9.7)	-10.64	(11.51)	28.79***	(9.45)	-12.95	(11.24)
2 years of post-secondary school	25.88***	(9.42)	-2.60	(12.31)	26.79***	(9.55)	-4.81	(12.55)
Father education level								
No or not finished elementary	-8.19	(9.220	-5.92	(13.67)	-9.40	(9.27)	-4.33	(13.93)
Elementary/middle school	-2.62	(9.32)	9.82	(10.32)	-3.04	(9.04)	10.74	(10)
Secondary school	5.37	(9.28)	18.73	(13.25)	5.28	(8.93)	20.20	(13.02)
2 years of post-secondary school	24.87***	(9.19)	-2.91	(9.67)	24.76***	(8.89)	-2.24	(9.86)
Both parents Egyptian=1	39.87***	(7.35)	16.35**	(8.17)	39.18***	(7.65)	16.20**	(8.08)
No of books at your home								
One bookcase	8.17	(5.97)	6.31	(8.6)	6.32	(6.02)	7.45	(8.69)
Two bookcases or more	-1.60	(7.57)	2.71	(11.16)	-1.01	(7.73)	3.54	(11.23)
Home possession index								
High	33.41***	(7.65)	3.19	(10.59)	35.05***	(7.34)	-0.21	(10.21)
Medium	19.18***	(4.25)	-1.63	(7.83)	19.06***	(4.1)	-1.31	(7.63)
Student gender (male =1)	-10.80	(35.7)	-		-36.97	(38.11)	-	
Test Language spoken at home (always=1)	-26.52***	(4.67)	16.381**	(6.84)	-28.61***	(5.17)	20.30***	(7.2)
Computer use								
Both at home and school	-24.85***	(8.82)	5.88	(11.72)	-23.11***	(8.35)	2.33	(11.09)
Either home or school	-23.83***	(6.37)	2.67	(8.16)	-22.17***	(6.02)	0.19	(8.02)
PlayStation or similar games yes = 1	-13.99***	(4.79)	-10.686*	(6.49)	-13.38**	(5.24)	-10.56	(6.97)
Test language (Arabic=1)	-39.88*	(23.29)	-10.60	(26.46)	-35.12**	(17.19)	-15.01	(20.02)
Teacher characteristics and school resources								
Teacher gender (male = 1)	-2.77	(8.14)	7.67	(10.24)	1.81	(8.66)	-7.48	(10.97)
Teacher years of experience	1.03**	(0.42)	0.00	(0.6)	-0.37	(0.61)	-0.17	(0.79)
Teaching certificate	7.40	(10.73)	-3.29	(11.01)	8.31	(9.12)	-13.19	(10.75)
Availability of school resources								
Medium	10.56	(9.82)	-22.270**	(10.87)	12.24	(10.44)	-25.63**	(11.91)
Low	-20.38	(21.71)	2.13	(24.3)	-38.24	(25.77)	27.14	(28.64)
Teacher formal education								
University	-0.47	(20.23)	-13.00	(20.84)	-34.46**	(14.02)	39.99*	(20.68)
Postgraduate studies	-22.14	(24.71)	10.02	(26.62)	-59.91***	(16.32)	75.79***	(28.76)
Type of community (> 50000 people = 1)	6.22	(7.9)	4.77	(9.65)	8.38	(8.16)	7.31	(9.87)
% disadvantaged std (>50%=1)	-17.71**	(8.71)	19.42*	(10.74)	-18.35**	(8.96)	17.99	(11.94)
Class size (more than 41 =1)	-8.45	(7.51)	5.24	(12.23)	-4.65	(8.1)	-5.09	(10.78)
Constant			413.60***	(36.12)			458.69***	(26.71)
Controls for missing included			Yes				Yes	

TIMSS Sampling weights employed, Jackknife standard errors in parentheses, Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data is from TIMSS 2007 for Egypt. Omitted categories are: university degree or higher, foreigners, no or few books, low home possessions, girl, not always, other or none, no, English, female, no, high resources, not university, less than 50000, less than 50%, less than41 .

Table A-3.14: Population (10 years & over), by educational status & sex in Egypt, results of 2006 pop. Census (percentage)

	Illiterate	Read & write	Illiteracy	Below intermediate	Intermediate	Above intermediate	University degree	Above university degree	NA
Male	22.34	13.41	1.21	20.84	28.18	2.82	10.8	0.32	0.08
Female	37.26	10.45	0.72	17.95	23.31	2.23	7.85	0.02	0.08
Total	29.64	11.96	0.97	19.42	25.8	2.53	9.35	0.24	0.08

Source: Central Agency for Public Mobilization and Statistics (CAPMAS), 2006 Census. (NA: Not Available)

Table A-3.15: Estimates of Parents' Education Interaction with Home Possession (high)

	Maths				Science			
	(1) mother interaction		(2) father interaction		(3) mother interaction		(4) father interaction	
Mother EDC								
Elementary/middle SCL	-2.215	(5.066)			-1.350	(5.362)		
Secondary school	14.579**	(6.611)			16.194**	(6.872)		
Post secondary SCL	17.644**	(7.050)			19.620***	(7.566)		
Uni or PG	-12.510*	(7.352)			-10.958	(7.800)		
Father EDC								
Elementary/middle SCL			14.647**	(6.614)			14.669**	(6.663)
Secondary school			27.269***	(5.787)			27.523***	(5.918)
Post secondary not uni			37.048***	(5.471)			37.146***	(5.842)
Uni or PG			4.561	(7.269)			4.648	(7.264)
HPI (high) X Elementary	-9.908	(13.140)	-19.827	(16.451)	-9.466	(13.483)	-18.173	(16.545)
HPI (high) X Secondary	3.231	(12.699)	-11.107	(15.701)	2.487	(13.671)	-10.354	(16.357)
HPI (high) X Post sec	1.895	(10.186)	-9.591	(11.779)	2.615	(10.356)	-7.077	(11.945)
HPI (high) X Uni/PG	24.856*	(12.806)	21.991**	(10.961)	25.623**	(13.031)	22.143*	(11.336)
Home Possessions (high)	32.078***	(7.305)	38.098***	(8.635)	32.655***	(7.762)	37.822***	(9.172)
Constant	398.338***	(28.701)	397.594***	(28.879)	434.905***	(23.174)	433.858***	(23.461)
Other variables and controls for missing	Yes		Yes		Yes		Yes	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.16: Estimates of Parents' Education Interaction with High Parental Support (PS)

	Maths				Science			
	(1)model with PS		(2) Interaction of father education X PS		(3) model with PS		(4) Interaction of father education X PS	
Mother education								
Elementary/middle Scl	-2.60	(5.06)			-2.21	(5.46)		
Secondary school	14.40**	(6.31)			15.79**	(6.42)		
Post-secondary Scl	16.57**	(6.67)			17.22**	(7.40)		
Uni or PG	-7.69	(6.83)			-5.99	(7.26)		
Father Education								
Elementary/middle Scl	13.75**	(6.57)	13.318**	(6.599)	12.80*	(6.67)	12.989*	(6.949)
Secondary Scl	26.23***	(6.01)	24.767***	(6.687)	25.22***	(6.11)	26.981***	(6.700)
Post-secondary school	35.21***	(5.51)	37.733***	(5.614)	34.48***	(5.79)	38.392***	(6.711)
Uni or PG	10.23	(6.58)	4.975	(7.102)	9.02	(6.67)	2.354	(8.291)
PS (high)	26.66***	(8.72)	23.338**	(11.072)	31.34***	(8.64)	32.202***	(10.009)
PS (Medium)	8.52	(6.54)	8.587	(6.547)	14.95*	(7.94)	14.699*	(7.951)
PS (high) X Elementary			2.861	(10.541)			-0.864	(10.369)
PS (high) X Secondary			10.547	(13.229)			-6.738	(12.408)
PS (high) X Post sec			-11.008	(10.544)			-11.715	(9.852)
PS (high) X Uni or PG			27.225**	(12.395)			19.253*	(10.747)
Constant	366.59***	(26.64)	367.602***	(27.322)	406.17***	(26.56)	405.745***	(26.099)
Other variables and controls for missing	yes		yes		yes		yes	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.17: Interaction of Parents' highest level Education and computer use PC (both at home and school)

	Maths		Science	
Parents highest level of EDC	*b*	*se*	*b*	*se*
lower-secondary	11.637*	(6.183)	7.436	(5.160)
upper-secondary	29.164***	(6.861)	23.400***	(5.548)
post-secondary not uni	35.791***	(7.140)	29.443***	(7.231)
university degree	-3.632	(7.240)	-11.099*	(6.112)
Lower SEC X PC	-1.938	(11.445)	-1.298	(11.666)
Upper SEC X PC	7.446	(11.867)	1.603	(11.031)
Post SEC X PC	20.969*	(11.072)	23.176*	(11.888)
Uni X PC	39.162***	(11.774)	33.125***	(10.609)
PC home and SCL	-34.105***	(8.368)	-42.187***	(10.454)
PC home or SCL	-21.435***	(4.160)	-25.176***	(4.422)
Constant	399.747***	(28.788)	437.151***	(24.375)
Other variables and controls for missing	Yes		Yes	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt

Table A-3.18: Estimates of Family, Student and Schools on Test scores and fixed effect estimates (Maths)

DV : Test scores (5 plausible values)	(1)		(2)		(3)	
	OLS no school controls		**OLS school controls**		**School Fixed Effects**	
Family and student background	*b*	*se*	*b*	*se*	*b*	*se*
Mother education level						
Elementary/middle school	-1.355	(5.068)	-3.036	*(5.101)*	-1.383	(4.668)
Secondary school	18.809***	(5.936)	14.987**	*(6.216)*	8.361	(6.027)
2 years of post secondary school	25.365***	(6.791)	17.584***	*(6.703)*	7.411	(6.473)
University degree or higher	0.114	(7.085)	-6.723	*(6.918)*	-12.367*	(6.480)
Father education level						
Elementary/middle school	15.136**	(6.591)	13.683**	*(6.561)*	9.278	(7.053)
Secondary school	28.509***	(6.107)	26.310***	*(6.012)*	19.981***	(6.263)
2 years of post secondary school	41.145***	(5.475)	35.144***	*(5.403)*	27.290***	(5.720)
University degree or higher	15.773**	(6.552)	10.611	*(6.631)*	4.950	(6.043)
Both parents Egyptian	49.557***	(5.348)	49.427***	*(5.106)*	46.604***	(3.843)
Books at home (one bookcase)	9.737**	(4.440)	11.126***	*(4.313)*	7.670*	(4.089)
Books at home (two bookcases or more)	0.275	(6.501)	0.850	*(6.280)*	3.460	(4.015)
Home possessions index						
High	47.605***	(4.728)	34.731***	*(4.372)*	22.391***	(4.175)
Medium	22.654***	(3.836)	18.558***	*(3.532)*	12.360***	(3.219)
student gender (male =1)	-10.569*	(5.393)	-9.342*	*(5.422)*	2.758	(4.998)
Testing lang. spoken at home (always=1)	-19.586***	(3.905)	-17.994***	*(3.721)*	-12.428***	(3.780)
Computer use						
Both at home and school	-21.085***	(5.183)	-21.879***	*(4.965)*	-20.010***	(4.500)
Either home or school	-22.008***	(4.301)	-21.822***	*(4.233)*	-18.025***	(3.962)
PlayStation (yes = 1)	-19.289***	(3.192)	-19.533***	*(3.073)*	-17.746***	(3.238)
Teacher characteristics and school resources						
Test language (Arabic=1)			-40.758***	*(12.087)*		
Teacher gender (male = 1)			-0.642	*(7.657)*		
Teacher years of experience			1.065***	*(0.388)*		
Teaching certificate			8.057	*(9.587)*		
Medium school resources			-3.214	*(7.580)*		
Low school resources			-19.639	*(13.745)*		
Teacher formal EDC (university=1)			-5.361	*(23.189)*		
Teacher formal EDC(PG=1)			-13.253	*(24.771)*		
Type of community (> 50000 = 1)			9.816	*(6.513)*		
% of disadvantaged std (> 50%=1)			-7.040	*(6.254)*		
Class size (more than 41 =1)			-4.920	*(6.393)*		
Constant	365.975***	(8.602)	400.594***	*(28.554)*	371.562***	(7.239)
Missing obs. Controls	*Yes*		*Yes*		*Yes*	
Adjusted- r square	.2124		*.2422*		*.3889*	
N	*6582*		*6582*		*6582*	
(4) The Null Model					*Maths*	
Only School Dummies Included					R^2.2972	
N					*6582*	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.19: Estimates of Family, Student and Schools on Test scores and fixed effect estimates (Science)

DV : Test scores (5 plausible values)	(1)		(2)		(3)	
	OLS no school controls		**OLS school controls**		**School Fixed Effects**	
Family and student background	b	se	b	se	b	se
Mother education level						
Elementary/middle school	-0.000	(4.690)	-1.276	(4.868)	-0.563	(4.271)
Secondary school	19.525***	(5.220)	16.464***	(5.510)	8.388*	(4.946)
2 years of post secondary school	22.429***	(6.837)	17.526**	(7.172)	5.346	(6.042)
University degree or higher	-5.148	(6.649)	-9.847	(6.582)	-17.149***	(5.475)
Father education level						
Elementary/middle school	12.985**	(5.422)	11.773**	(5.312)	7.781	(5.349)
Secondary school	23.775***	(5.614)	21.762***	(5.680)	15.582***	(5.127)
2 years of post secondary school	38.545***	(6.343)	33.667***	(6.584)	26.154***	(6.182)
University degree or higher	9.680	(6.780)	5.898	(6.699)	0.686	(6.230)
Both parents Egyptian	49.138***	(4.803)	47.361***	(5.071)	46.288***	(4.493)
Books at home (one bookcase)	12.326**	(4.904)	12.069**	(4.798)	9.800**	(4.646)
Books at home (two bookcases or more)	-1.239	(6.947)	-1.033	(6.761)	2.107	(4.641)
Home possessions index						
High	44.628***	(5.793)	35.658***	(5.997)	22.752***	(5.818)
Medium	21.734***	(4.326)	18.467***	(4.228)	12.181***	(4.276)
student gender (male =1)	-14.159***	(5.249)	-16.499***	(5.501)	3.502	(5.509)
Testing lang. spoken at home (always=1)	-18.339***	(3.926)	-16.935***	(4.165)	-11.424***	(3.845)
computer use						
Both at home and school	-30.885***	(6.687)	-31.587***	(6.537)	-29.546***	(6.342)
Either home or school	-26.122***	(4.572)	-25.630***	(4.457)	-21.953***	(4.610)
PlayStation (yes = 1)	-14.804***	(3.089)	-14.602***	(3.197)	-13.413***	(3.045)
Teacher characteristics and school resources						
Test language (Arabic=1)			-14.025	(12.033)		
Teacher gender (male = 1)			-2.516	(6.353)		
Teacher years of experience			-0.221	(0.521)		
Teaching certificate			0.740	(7.426)		
Medium school resources			-1.360	(8.648)		
Low school resources			-16.327	(17.100)		
Teacher formal EDC (university=1)			-13.289	(16.125)		
Teacher formal EDC(PG=1)			-22.468	(21.729)		
Type of community (> 50000 = 1)			13.031*	(7.234)		
% of disadvantaged std (> 50%=1)			-11.697**	(5.764)		
Class size (more than 41 =1)			-4.934	(6.546)		
Constant	390.212***	(7.869)	432.479***	(23.783)	392.628***	(6.520)
Missing obs. Controls	Yes		Yes		Yes	
Adjusted- r square	.2016		.2193		.3739	
N	6582		6582		6582	
(4) The Null Model					Science	
Only School Dummies Included					R^2 .2807	
N					6582	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.20: Average test scores on student's home spoken language, parents' nationality, and test language

Home spoken lang.	Born in country	N	% total	Maths			Science		
				Mean	se	Std.dev	Mean	se	Std.dev
Always	Both parents	3274	52.06	396.25	3.78	95.21	414.25	3.89	93.72
3904 (62.08%)	Only one parent	441	7.01	341.32	9.07	89.75	357.89	7.9	90.4
	Neither parent	189	3.01	331.51	8.03	79.27	355.01	7.22	78.22
Almost always	Both parents	945	15.03	433.98	5.01	100.07	448.08	5.19	100.79
1109 (17.63%)	Only one parent	129	2.05	372.2	12.37	101.34	387.84	13.46	98.75
	Neither parent	35	0.56	340.62	22.29	91.07	361.03	24.16	85.4
Sometimes	Both parents	838	13.32	417.12	6.54	96.65	435.16	6.41	97.79
992(15.77%)	Only one parent	118	1.88	358.14	14.85	97.69	374.89	13.61	95.88
	Neither parent	36	0.57	389.94	22.31	90.46	400.01	19.86	92.47
Never	Both parents	227	3.61	410.41	10.75	101.82	424.35	12.29	99.02
284 (4.52%)	Only one parent	43	0.68	332.9	23.32	98.43	357.03	33.48	100.77
	Neither parent	14	0.22	311.25	41.2	87.99	344.93	45.3	78.03

Table A-3.21: Interaction of test language and Home Possession Index

Dependant Variable : students' Maths Test Scores (5 Plausible Values)	Maths		Science	
Family and student background	*b*	*se*	*b*	*se*
ARABIC TEST LANGUAGE	-86.533***	(29.436)	-86.086***	(25.488)
High Home possess	-19.975	(23.585)	-17.834	(21.974)
Medium Home possess	-15.459	(20.233)	-16.675	(21.378)
Arabic X High possessions	56.487**	(24.506)	55.145**	(23.088)
Arabic X Medium possessions	33.893	(20.757)	35.638	(21.962)
Other variables and Controls for missing included	yes		yes	

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Figure A-3.1: Distribution of students test scores for Maths cognitive domain by test language

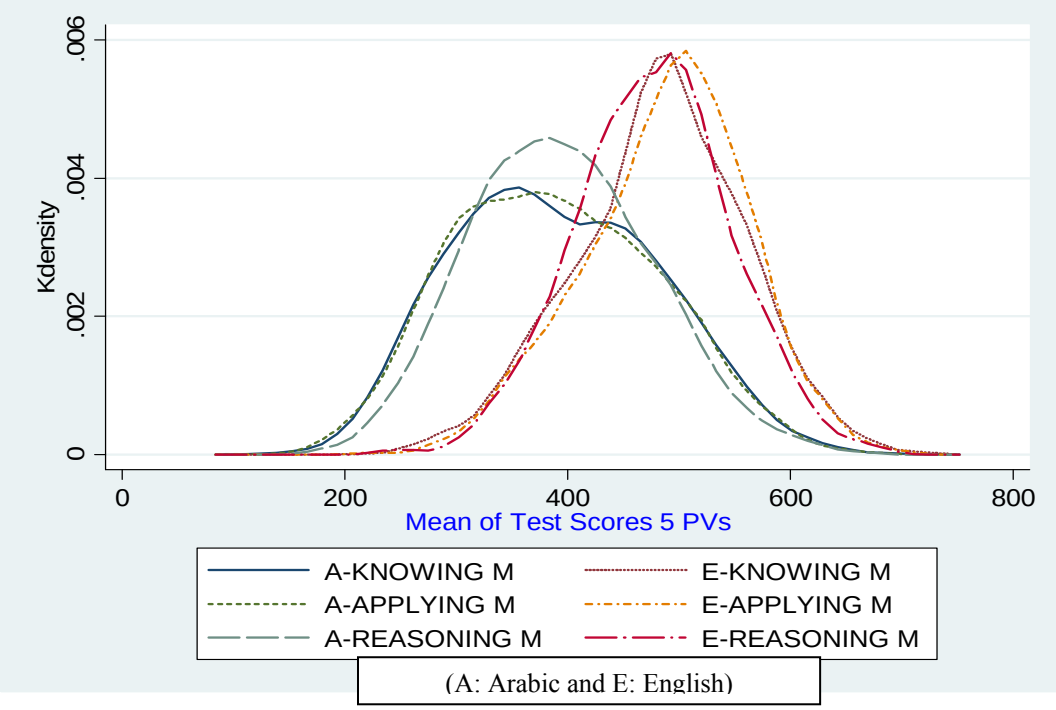


Figure A-3.2: Distribution of students test scores for Science cognitive domain by test language

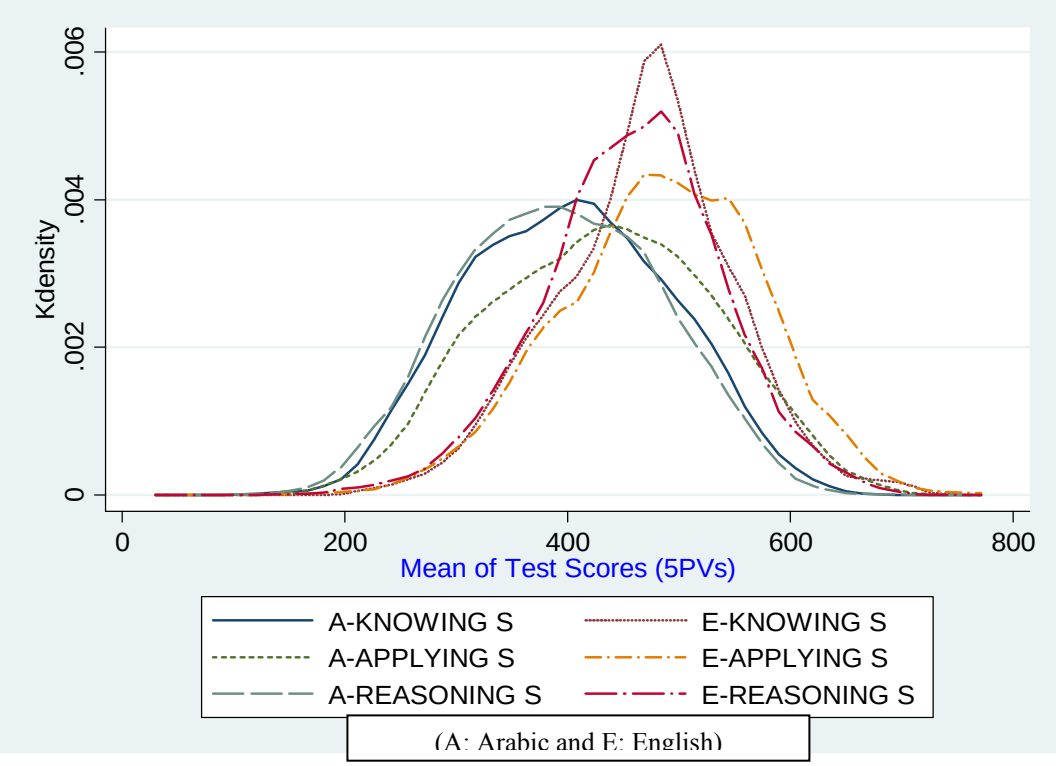


Table A-3.22: Family, School Background (TEST LANGUAGE) and test scores

Dependant Variable : Test Scores (5 Plausible Values)								
	Maths	Science	Knowing		Applying		Reasoning	
			Maths	Science	Maths	Science	Maths	Science
Family controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Arabic Test language	-40.758*** (12.087)	-14.025 (12.033)	-43.656*** (12.714)	-18.952* (11.475)	-45.696*** (14.384)	0.664 (13.945)	-33.211*** (12.761)	-22.120* (12.857)
School controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Missing O. controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	400.594*** (28.554)	432.479*** (23.783)	402.050*** (28.965)	433.873*** (24.913)	412.824*** (34.570)	446.340*** (26.752)	401.147*** (24.418)	426.953*** (21.786)

Jackknife standard errors in parentheses, Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007

Table A-3.23: Parental support and student's motivation

DV : Test scores(PVs)	Maths		Science	
	b	*se*	*b*	*se*
Level of parental support				
High/very high	25.507***	(8.808)	31.124***	(8.096)
Medium	8.673	(6.489)	14.819*	(7.817)
Low/very low (omitted)				
Student's expectation of education level				
University or higher	24.026***	(3.689)	23.305***	(3.788)
Below university (omitted)				
Other controls included	Yes		Yes	
Controls for missing observations	Yes		Yes	
Constant	358.239***	(28.431)	389.339***	(25.768)

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.24: Parental involvement and teachers pedagogical autonomy effects on test scores

DV : Test scores(PVs)	Maths		Science	
Parental involvement	*b*	*se*	*b*	*se*
Medium	-24.912**	(11.175)	0.184	(9.967)
Low	-29.535***	(11.143)	-13.515	(10.229)
Very low	-40.689***	(11.953)	-17.992*	(10.814)
High/very high (omitted)	-	-	-	-
Autonomy (yes = 1)	-0.047	(7.810)	-3.620	(8.022)
Other controls included	Yes		Yes	
Controls for missing observations	Yes		Yes	
Constant	402.779***	(20.225)	440.996***	(23.411)

Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Data are from TIMSS 2007 for Egypt.

Table A-3.25: Estimates across different schools for maths test scores

DV: maths test scores	All schools		Mixed schools		single-sex schools	
VARIABLES	b	se	b	se	b	se
Lower-sec EDC	7.60	(5.92)	4.29	(10.73)	5.83	(6.84)
Upper-sec	23.48***	(6.42)	24.92*	(14.96)	18.57**	(7.59)
Post-sec not UNI	33.29***	(6.99)	32.84**	(15.25)	28.65***	(7.51)
University degree	1.31	(6.82)	-0.46	(14.23)	-1.66	(7.30)
Natives	48.65***	(5.19)	60.87***	(9.09)	45.79***	(4.90)
One bookcases	10.29**	(4.33)	8.02	(9.23)	10.10**	(3.96)
Two bookcases	1.95	(6.23)	-0.46	(12.28)	6.01	(6.33)
Home possess H	56.66***	(5.20)	43.55***	(12.88)	54.79***	(5.68)
Home possess M	41.17***	(4.79)	37.27***	(7.44)	38.15***	(5.45)
Boy student	-9.87*	(5.42)	4.59	(5.34)	-17.50**	(7.93)
Test language Arabic	-42.83***	(11.32)	-18.29	(20.86)	-53.33***	(16.05)
TL spoken ALs	-18.94***	(3.79)	-16.09***	(5.78)	-17.75***	(4.54)
PC at H&SCL	-26.33***	(5.08)	-17.60*	(10.68)	-28.51***	(5.20)
PC at H/SCL	-23.69***	(4.24)	-16.39*	(9.04)	-25.08***	(4.53)
Male teacher	1.27	(7.59)	7.69	(20.35)	-2.58	(7.04)
T. Experience	0.98***	(0.36)	-0.08	(1.79)	1.20**	(0.54)
T. Certificate	7.22	(9.47)	21.12	(12.95)	-1.57	(11.96)
M SCL RCS	-2.63	(7.26)	1.53	(30.60)	-7.57	(7.26)
L SCL RSC	-19.55	(13.85)	-27.44	(32.53)	-1.81	(13.00)
T. UNI Degree	0.14	(20.69)	-9.07	(70.88)	20.00	(22.90)
COMMU.>50000	10.06	(6.61)	23.82	(31.13)	7.60	(6.51)
Pov 50% Disadv	-8.18	(5.85)	-4.15	(20.95)	-12.94**	(6.28)
Class size	-0.62	(1.33)	-3.71	(4.96)	0.28	(1.58)
Class size Sqr	0.00	(0.02)	0.03	(0.07)	-0.00	(0.02)
Constant	390.94***	(32.89)	416.09***	(97.81)	382.77***	(42.38)
Observations	6582		2084		4498	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Table A-3.26: Effects of Attending Single-Sex vs. Co-education Schools for Boys and Girls (maths)

DV: maths test scores	Boys' schools		Boys in mixed schools		Girls' schools		Girls in mixed schools	
Average maths scores	385		382		408		376	
VARIABLES	b	se	b	se	b	se	b	se
Lower-sec EDC	5.88	(9.87)	10.29	(14.88)	5.41	(7.92)	-0.55	(12.75)
Upper-sec	28.25**	(11.27)	35.96**	(14.08)	8.74	(8.28)	16.74	(20.61)
Post-sec not UNI	33.75***	(10.49)	32.66*	(17.56)	22.71**	(8.83)	36.88*	(19.95)
University degree	0.83	(10.72)	11.83	(14.13)	-3.19	(9.17)	-8.60	(20.77)
Natives	54.70***	(6.29)	63.28***	(8.52)	31.56***	(7.14)	54.88***	(14.07)
One bookcases	15.05**	(6.64)	11.56	(12.31)	7.84*	(4.50)	4.12	(15.61)
Two bookcases	6.74	(9.72)	4.42	(15.88)	3.10	(9.05)	-5.97	(18.12)
Home possess H	48.21***	(8.68)	41.10**	(16.18)	58.82***	(6.28)	44.57***	(16.40)
Home possess M	31.82***	(7.84)	30.76**	(14.03)	42.60***	(6.29)	44.69***	(12.85)
Boy student	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Test language Arabic	-83.45**	(35.47)	-22.77	(23.85)	-65.82**	(26.46)	-15.10	(23.58)
TL spoken ALs	-12.19*	(6.79)	-6.70	(6.94)	-21.63***	(5.43)	-26.23**	(10.37)
PC at H&SCL	-32.63***	(7.03)	-10.05	(15.23)	-21.83**	(9.37)	-27.76*	(16.63)
PC at H/SCL	-29.38***	(6.16)	-8.50	(12.95)	-18.77***	(7.14)	-25.08*	(13.35)
Male teacher	4.23	(10.28)	9.66	(25.04)	-6.39	(8.98)	4.29	(18.80)
T. Experience	1.97***	(0.73)	-0.18	(2.07)	0.40	(0.45)	0.36	(1.76)
T. Certificate	-6.19	(16.50)	32.33*	(16.58)	-26.17**	(12.68)	7.63	(16.06)
M SCL RCS	-18.68**	(7.89)	-0.23	(33.89)	14.17	(12.52)	7.44	(29.18)
L SCL RSC	12.05	(25.69)	-35.98	(32.63)	13.10	(37.81)	-15.51	(43.52)
T. UNI Degree	0.00	(75.17)	0.00	(164.6)	44.41**	(20.30)	-46.09	(140.17)
COMMU.>50000	14.57	(10.12)	21.08	(36.48)	2.24	(8.36)	24.06	(28.15)
Pov 50% Disadv	-1.25	(9.29)	-6.55	(27.76)	-31.17***	(11.54)	-1.60	(18.33)
Class size	2.11	(2.92)	-5.71	(5.37)	-2.42	(5.45)	-1.18	(7.85)
Class size Sqr	-0.04	(0.05)	0.07	(0.09)	0.03	(0.07)	-0.01	(0.11)
Constant	370.65***	(107.48)	412.86***	(160.0)	464.89***	(112.71)	442.89**	(193.41)
Observations	2237		1087		2261		997	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Table A-3.27: Differences across schools for science test scores

DV: science test scores	All schools		Mixed schools		single-sex schools	
VARIABLES	b	se	b	se	b	se
Lower-sec EDC	6.24	(4.91)	1.30	(7.84)	5.61	(5.90)
Upper-sec	21.33***	(5.40)	17.81	(11.43)	19.00***	(6.80)
Post-sec not UNI	33.24***	(6.43)	27.23*	(14.78)	32.72***	(6.64)
University degree	-4.47	(5.71)	-9.52	(12.99)	-5.04	(6.57)
Natives	48.49***	(5.21)	61.33***	(9.04)	42.23***	(5.29)
One bookcases	12.96***	(4.77)	11.81	(9.66)	13.15***	(4.51)
Two bookcases	0.53	(6.69)	-3.64	(14.41)	2.26	(6.75)
Home possess H	32.36***	(5.59)	33.72***	(12.42)	29.46***	(6.09)
Home possess M	16.21***	(4.04)	6.70	(8.67)	18.88***	(4.15)
Boy student	-16.21***	(5.75)	6.06	(5.61)	-26.32***	(7.97)
Test language Arabic	-16.21	(12.33)	-8.66	(19.31)	-32.84*	(17.08)
TL spoken ALs	-17.47***	(4.22)	-12.81	(8.59)	-16.38***	(4.69)
PC at H&SCL	-32.59***	(6.62)	-24.94**	(11.37)	-32.56***	(6.89)
PC at H/SCL	-25.94***	(4.52)	-16.84*	(8.90)	-25.83***	(4.68)
Male teacher	-1.40	(6.44)	8.83	(15.13)	-3.96	(6.51)
T. Experience	-0.14	(0.55)	-1.37	(1.05)	0.38	(0.71)
T. Certificate	1.17	(7.34)	-2.68	(14.77)	7.05	(8.83)
M SCL RCS	-2.53	(9.54)	-3.31	(38.91)	0.86	(10.56)
L SCL RSC	-19.69	(17.25)	-47.17	(36.28)	-1.70	(22.26)
T. UNI Degree	-11.82	(16.17)	-35.05	(33.77)	-4.83	(20.08)
COMMU.>50000	13.40*	(7.71)	14.67	(22.69)	11.02	(8.32)
Pov 50% Disadv	-13.14**	(5.84)	-13.63	(17.79)	-17.04***	(6.42)
Class size	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Class size Sqr	-1.18	(1.36)	-2.49	(3.40)	-0.54	(1.63)
Constant	438.45***	(25.67)	448.04***	(43.47)	444.19***	(27.72)
Observations	6582		2084		4498	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Table A-3.28: Effects of Attending Single-Sex vs. Co-education Schools for Boys and Girls (science)

DV: science test scores	Boys' schools		Boys in mixed schools		Girls' schools		Girls in mixed schools	
Average science scores	400		399		428		393	
VARIABLES	B	se	b	se	B	se	b	se
Lower-sec EDC	7.95	(7.40)	4.05	(11.85)	-0.19	(8.32)	0.87	(11.07)
Upper-sec	27.65***	(8.70)	29.09*	(15.58)	5.25	(9.73)	13.90	(15.83)
Post-sec not UNI	37.19***	(9.54)	27.46	(19.28)	23.19**	(9.81)	26.90*	(15.92)
University degree	-2.48	(10.37)	2.37	(15.05)	-10.46	(9.50)	-17.15	(19.02)
Natives	51.25***	(6.42)	64.51***	(8.37)	33.39***	(8.66)	54.03***	(13.15)
One bookcases	14.59**	(6.87)	16.52	(10.60)	13.03**	(5.93)	8.72	(14.54)
Two bookcases	2.68	(10.17)	-1.89	(18.93)	4.02	(9.04)	-12.79	(17.99)
Home possess H	26.91***	(7.51)	32.87*	(19.87)	31.79***	(8.48)	34.07**	(15.93)
Home possess M	18.19***	(5.68)	3.02	(13.16)	18.28***	(5.59)	9.03	(9.38)
Boy student	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Test language Arabic	-58.78	(38.72)	-13.57	(23.42)	-41.47	(28.93)	-4.90	(20.64)
TL spoken ALs	-10.74	(7.54)	1.27	(8.99)	-21.15***	(5.40)	-26.64**	(11.92)
PC at H&SCL	-39.24***	(8.54)	-13.98	(17.85)	-23.27**	(10.44)	-36.63**	(15.48)
PC at H/SCL	-31.80***	(6.51)	-8.39	(15.12)	-19.63**	(8.03)	-21.98**	(10.14)
Male teacher	-9.96	(9.99)	6.51	(19.35)	-4.34	(11.10)	10.49	(13.55)
T. Experience	-0.86	(1.00)	-0.86	(1.33)	0.78	(0.87)	-1.73	(1.06)
T. Certificate	1.23	(14.23)	-7.68	(15.47)	9.24	(13.04)	1.28	(15.39)
M SCL RCS	-24.34**	(11.48)	1.71	(46.67)	25.49	(15.77)	-5.75	(31.96)
L SCL RSC	10.92	(32.28)	-44.32	(37.12)	11.34	(72.51)	-47.29	(38.47)
T. UNI Degree	-1.95	(33.27)	-48.48	(41.18)	-31.58	(19.34)	-33.02	(30.38)
COMMU.>50000	20.68*	(10.92)	13.79	(27.95)	4.08	(12.64)	14.54	(19.58)
Pov 50% Disadv	-10.16	(12.45)	-2.05	(24.46)	-33.70***	(8.97)	-23.83	(15.17)
Class size	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Class size Sqr	-2.11	(1.96)	-0.90	(3.77)	-0.54	(1.85)	-3.77	(3.33)
Constant	477.42***	(54.96)	425.59***	(55.92)	474.21***	(38.95)	483.09***	(50.45)
Observations	2237		1087		2261		997	

Note: Jackknife Standard errors in parenthesis & (*** p<0.01, ** p<0.05, * p<0.1)

Appendix B-5: Principal component for home possessions

In this appendix we explain how we adopted the student's home possession index using principal component factor. The TIMSS data do not provide a measure of income or expenditure for family or students; however students were asked if they have certain items at their home. The items were basically related to the learning purposes but in the meanwhile could be seen as a reflection of socio-economic status. Egyptian students were asked if they have calculator (bs4gth01), computer (bs4gth02), study desk (bs4gth03), dictionary (bs4gth04), internet connection (bs4gth05), TV (bs4gth06), satellite TV channels (bs4gth07) and Telephone (bs4gth08). We use this information to construct an index for home possessions using principal factor analysis.

```
. pca bs4gth01 bs4gth02 bs4gth03 bs4gth04 bs4gth05 bs4gth06 bs4gth07 bs4gth08 , comp(2)

Principal components/correlation                  Number of obs    =       5806
                                                  Number of comp.  =          2
                                                  Trace            =          8
    Rotation: (unrotated = principal)             Rho              =     0.4985
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.7373	1.48644	0.3422	0.3422
Comp2	1.25086	.450344	0.1564	0.4985
Comp3	.80052	.0319532	0.1001	0.5986
Comp4	.768566	.0505991	0.0961	0.6947
Comp5	.717967	.0598983	0.0897	0.7844
Comp6	.658069	.0681024	0.0823	0.8667
Comp7	.589967	.113224	0.0737	0.9404
Comp8	.476743	.	0.0596	1.0000

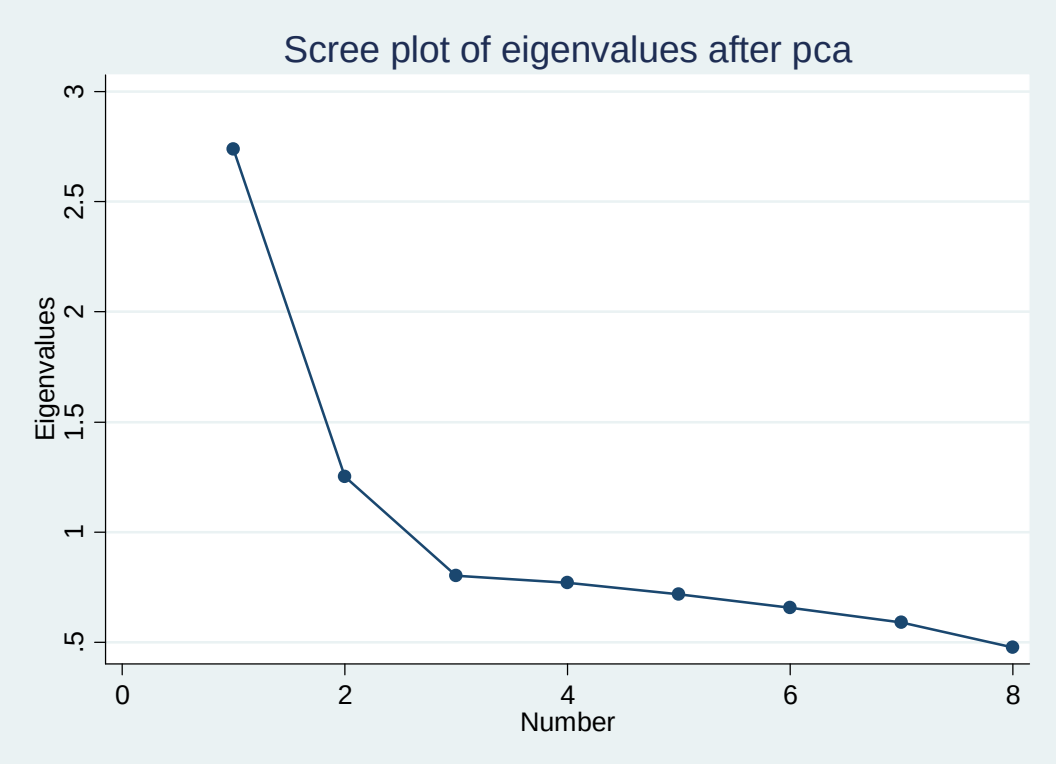
Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
bs4gth01	0.2871	0.3980	.5762
bs4gth02	0.3866	-0.4005	.3903
bs4gth03	0.3629	-0.0333	.6381
bs4gth04	0.3396	0.1862	.6409
bs4gth05	0.3736	-0.4950	.3114
bs4gth06	0.2878	0.5473	.3986
bs4gth07	0.3856	-0.2022	.5418
bs4gth08	0.3873	0.2447	.5144

Rotated components

Variable	Comp1	Comp2	Unexplained
bs4gth01	-0.0541	0.4878	.5762
bs4gth02	0.5554	-0.0377	.3903
bs4gth03	0.2914	0.2188	.6381
bs4gth04	0.1270	0.3659	.6409
bs4gth05	0.6091	-0.1165	.3114
bs4gth06	-0.1537	0.5990	.3986
bs4gth07	0.4216	0.1087	.5418
bs4gth08	0.1231	0.4413	.5144

Principal Component Analysis is a multivariate statistical technique used to reduce the number of variables in a data set from *n* correlated variables by creating uncorrelated indices or components. Each component is a linear weighted combination of the initial variables. The weights are given by eigenvectors of the correlation matrix or co-variance matrix if the data are standardized. The assets that more asymmetrically distributed among households are given more weights in PCA. The eigenvalue (variance) indicates the explained percentage of variation in the total data for each Principal component. A common method in PCA is to select the components which eigenvalue exceeds one. PCA could be used as a guidance to figure out the most influential variables among number of variables measuring wealth of households.



PCA indicates two factors with Eigen value greater than one. The choice might be to incorporate only one factor. The first factor has four variables explaining the most of its variations. The index could be chosen and include in the model as a continuous independent variable, though the interpretation of the estimates of this index would not be clear. Alternatively, the index might be categorized to indicate some reasonable meaning. Another approach is to use the PCA analysis to determine the main variable which then could be averaged together to give some indicator of the difference among the sample.

Scoring coefficients for orthogonal varimax rotation
sum of squares(column-loading) = 1

Variable	Comp1	Comp2
bs4gth01	-0.0541	0.4878
bs4gth02	0.5554	-0.0377
bs4gth03	0.2914	0.2188
bs4gth04	0.1270	0.3659
bs4gth05	0.6091	-0.1165
bs4gth06	-0.1537	0.5990
bs4gth07	0.4216	0.1087
bs4gth08	0.1231	0.4413

From the variable loading weights of factor one above, we can see that the main influential variables of the first factor are (2, 3, 5 and 7): computer, study desk, internet connection and satellite TV channels. We used the average of those variables to generate a three level index of home possessions. Besides including the chosen index other indexes have been tried out and it did not change the main findings. In the mean while the chosen index is more of representative to the important home possessions which reflect the socio-economic status of students' family and easy to interpret.

Chapter 4

EDUCATIONAL ATTAINMENT DETERMINANTS IN MENA

4.1 Introduction

Education is central to human capital capacity-building, a major determinant of economic development, but the Middle East and North Africa (MENA) suffers from many problems regarding education (Lietz et al. 2008). In this work we try to investigate and assess the determinants of educational attainment in MENA countries (in comparison to the more detailed study of Egypt in chapter five). The aim is to identify the factors that need to be addressed in designing policies to improve the quality of education in MENA countries. The lack of evidence on determinants of education in MENA is mainly due to lack of data, hence no large-scale testing of micro level data. The Trends in International Mathematics and Science Study (TIMSS) offers comprehensive data on international student achievement test scores which have the advantage of being comparable across countries. In TIMSS, eighth grade students of representative samples have been tested in maths and science; data include test scores, family background, school resources, and teacher characteristics. Comparative data such as TIMSS permit analysis of the factors influencing differences in education achievements across MENA countries, provided the data are of sufficient quality and the research design is appropriate (Glewwe 2002).

Empirical estimates of the determinants of educational attainment of students are focused on education production function to explore the relationship between students' educational outcomes and their inputs from family background as well as from school resources. Such evidence provides the foundation for many policy discussions and initiatives in developed countries (Woessmann 2005b). However, few developing countries have been fully analysed, especially Middle East and North Africa countries (MENA). Empirical evidence on MENA is even lower than the share of other developing regions such as sub Saharan Africa (SSA), Latin

America or southern Asia. For example, Ghana, Kenya, Bangladesh, India, Pakistan, Indonesia, Argentina, Bolivia, and Brazil are covered in the Glewwe et.al (2011) review, but only Turkey from MENA region is included.

This study tries to fill this gap by estimating education production functions using data on a representative sample of lower secondary students in eight MENA countries. This allows a comparison of the determinants of student performance between MENA countries and with other developing and developed countries. The main contribution is to identify any differences across MENA countries, with specific comparison to Egypt, in the factors determining educational achievements using comparable data on test scores. The meta-regression analysis allows us to evaluate and synthesise the effects of different variables across countries. Including quantile regression analysis allows for heterogeneity in the effect of school and family variables across the distribution of test scores.

We begin with a brief overview of some relevant characteristics of MENA countries in Section 4.2, covering Algeria, Egypt, Jordan, Iran, Saudi Arabia, Syria, Turkey and Tunisia. The eight countries share similarities in religion, language (except for Iran and Turkey), culture, history, geographical and to some extent political features. There are economic differences in terms of wealth from natural resources, per capita income and population. Although Egypt is the poorest country with GDP per capita below the MENA average, Egyptian students perform better than Algeria and Syria. TIMSS provides comparable data for the eight MENA countries; the data and summary statistics are discussed in chapter two in detail, we will refer to important points in the next section.

The econometric methods are outlined in Section 4.4. Three methods are employed for the cross-country analysis in addition to school fixed effects for the production function model. First, we estimate an educational production function for each country to examine the effect of school resources and of socioeconomic family characteristics (SES) on test score achievements in maths and science. Second, Meta-analysis is employed to identify any factors that are significant across the set of

countries. Third, quantile regressions are employed to assess if the influence of factors on attainment varies according to the level of attainment.

The study tackles three research questions: what are the main determinants of student performance in each country? How do the results vary across distributions and across different education systems in MENA? Is MENA educational production different from or similar to other educational systems? The potential determinants groups are family background measures (SES) and school resources measures.

Microeconometric student-level least-squares regressions, weighted by sampling probabilities and adjusted for clustering within schools are adopted in order to address the first question. A meta-analysis method is applied to address the comparability question and get a synthesis of the results. Quantile regressions are applied to investigate the differences across the distribution taking into consideration the sampling weights and clustering. Also, the study considers school fixed effects estimates to exploit the variation among students based on their family inputs.

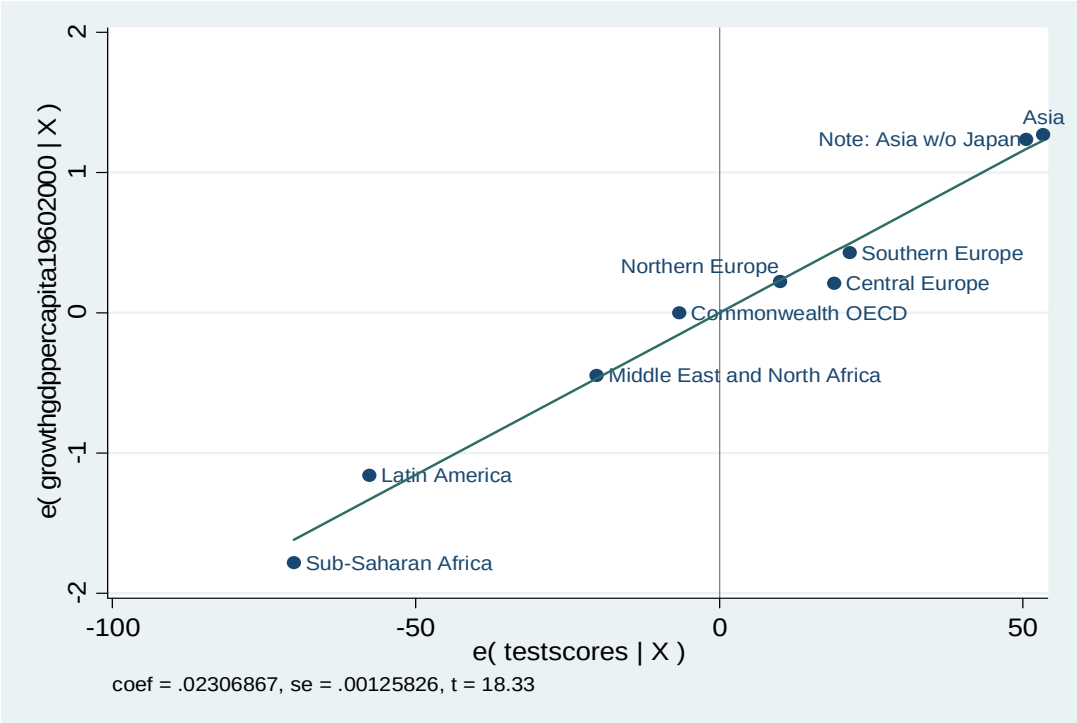
4.2 Background

Growth rates compared to educational achievements globally indicate some positive relationship. Hanushek and Woessmann (2005), using data on education and GDP per capita across world's regions (Figure 4-1) show a positive relation between education output and GDP per capita growth rates. Given levels of GDP per capita of MENA, MENA performs lower than predicted compared to other developing regions as shown in Figure 4-1. The inclusion of MENA dummy is not significant in such a regression. Figure 4-2 and Figure 4-3 show the relation between GDP per capita and test scores across selected countries.

The Arab oil countries have high GDP per capita but still underperformed in education outcomes. The eight MENA countries share unity of culture, language (except Iran and Turkey), history and geography that promotes some similarity in educational systems (Saber 1977). Although some countries possess natural resources, economic development performance has been poor; net growth rates (in non-oil economies) are very low compared to many other developing countries, and

even the high growth oil economies have relatively low levels of human development. Unemployment is high and human capital formation is low compared to the rest of the world.

Figure 4-1: Hanushek and Woessmann estimates of the test scores relation to Growth



Excluding oil countries changes the relations to be more positive. The low education outcome is clear from Figure 4-3 where Algeria, Egypt, Syria, Iran, Turkey, Jordan and Saudi Arabia (excluded from this figure) are below the 450 point level of maths. The findings indicate a motivation to investigate more about this relation in MENA.

The education outcome of developing countries in Sub-Saharan Africa and South Eastern Asia might be more sensible in terms of comparability. The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) provides data for the six grade students in the Southern and Eastern African countries for maths and reading. The maths scores are comparable to the TIMSS scores as they based on the same methodology and statistical foundations. The average maths scores for the set of countries (Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe) in 2007 is 509.5 points which above the average of MENA (412).

Figure 4-2: Maths test scores and GDP per capita for TIMSS selected countries

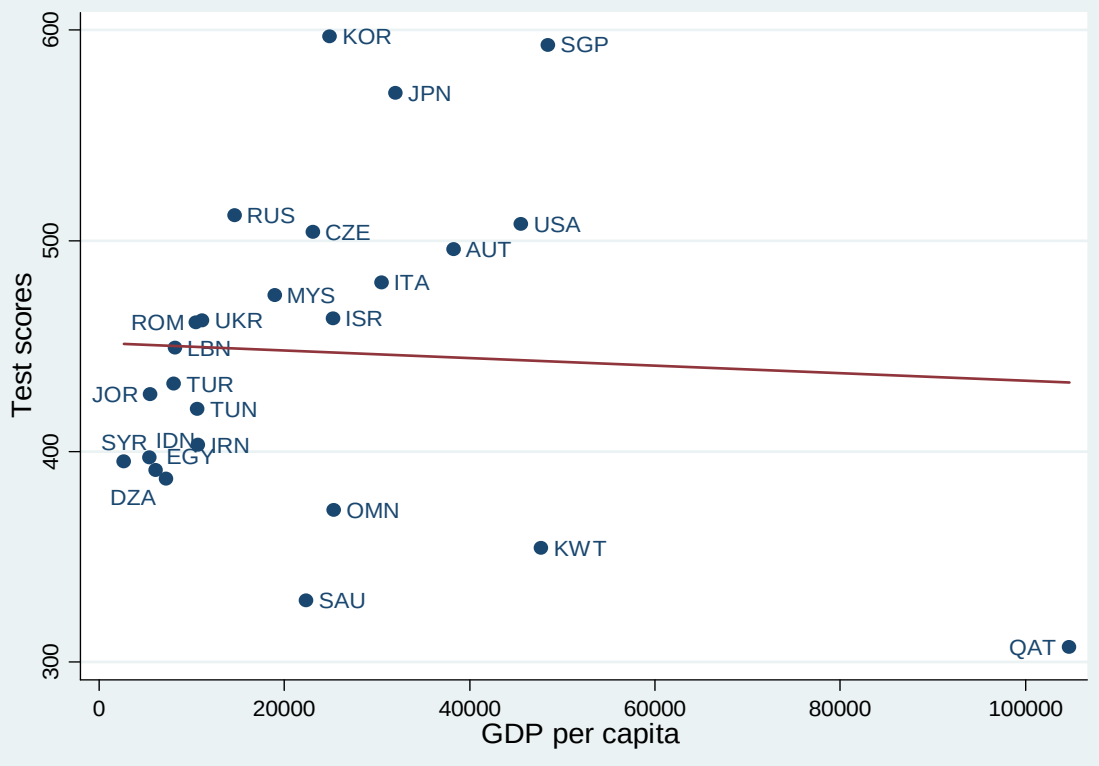
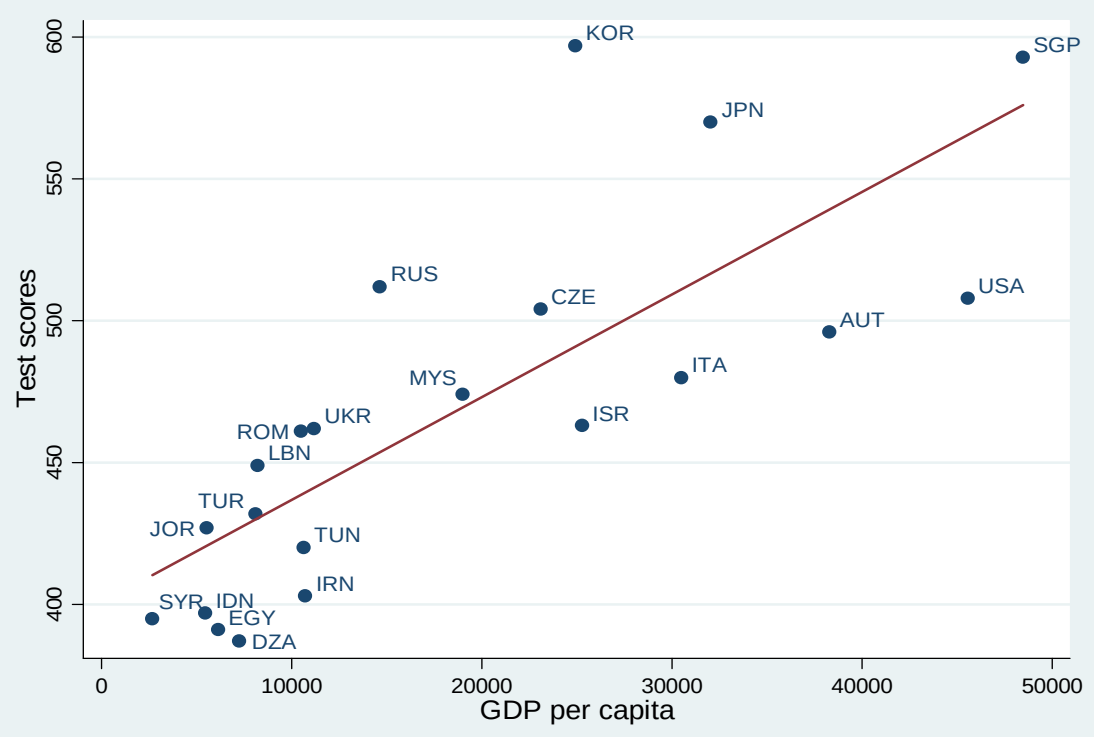


Figure 4-3: Maths test scores and GDP per capita for TIMSS (without high income Arab oil countries)



4.3 Literature Review

The Coleman Report (Equality of Educational Opportunity, 1966) initiated large theoretical debates and enriched the economics of education empirical research using education production functions. United States research on education has focused on resources effects especially class size effects. Hanushek (1995) summarizes studies on developing countries which provide evidence on education production function. Glewwe (2002) criticized many of the developing countries studies for the lack of methodological and data quality. Developing countries including Latin America, South Asia and sub-Saharan Africa have their share of the literature, although in most of the cases a single country study is undertaken. In MENA countries there is nothing to match any of those developed or even developing countries literature.

Heyneman (1997) discussed the educational quality in MENA and argued it is not a financial problem but it might be a culture problem, and the inefficient allocation of educational resources follows the central planning era concept of a school system to provide graduates for the public sector with planned fields of study. At the ninth grade, an exit examination determines student track, whether to go to university or to lower demand technical school, with the intention of restricting the number of university graduates. The lack of empirical evidence on MENA and the lack of available data restricted further research.

The vast majority of research on education quality is on industrialized or developed countries. However, research on developing countries has shifted from education quantity to education quality with increasing availability of measures of student performance in academic tests (Glewwe and Kremer 2006). As many of these studies suffer from serious methodological shortcomings, we have to be careful reviewing them (Glewwe 2002).

Examining the quality and efficiency of private and public education in India, Kingdon (1996) used data collected in 1991 from 902 students aged 13-14 in 30 schools in urban Lucknow in Uttar Pradesh, India. Estimating education production function for cognitive achievements (reading and mathematics) Kingdon examined

the impact of three school level variables (class size, index of physical facilities and teaching aids, and time of academic instructions per week) and five teacher variables (years of general education, years of general training, years of teaching experience, salaries in rupees per month, and teacher's average division). The most influential variables were the school resources, length of structured teaching time per week, school management type and teacher's cognitive skills. Class size, teacher training and teacher experience have no significant impact on student's achievements and years of teacher education is only just significant (at 10% level).

Glewwe and Jacoby (1994) used data from the 1991 Ghana Living Standards Survey and written tests covering reading (in English), mathematics and abstract thinking given to middle school students. Collective data about schools attended and teachers were used to estimate the impact on students' achievements in the tests. Only teaching experience was found to be significant and its impact was indirect through raising the grade level attained by students. Repairing roof leaks and providing blackboards have an impact on raising cognitive achievement of students on maths and reading.

Glewwe (2002) summarizes studies on Brazil, Ghana, India, and Jamaica. The estimated effects from Harbison and Hanushek (1992) for Brazil were relatively small. Only school facilities, writing materials, textbooks and teacher salary were significant. In Jamaica the largest impact was a change from never using textbooks to regular use in every lesson.

Exploring the effectiveness of In-Service Education and Training (INSET) in Namibia, O'Sullivan (2001) showed how to implement and benefit from putting the training mechanism in the right context. Implementing the INSET model for 99 lower primary teachers and 46 senior primary English teachers in 31 primary schools she collected data by interviews, semi-structured and unstructured observations, lesson observations, assessment of learners' work, and an examination of documents. She described factors of success to be school based and school focused programmes, objective training to teacher's needs, preferring trainers related to classroom realities, cyclical and complementary courses, open training to

add new practices and skills, supervision and follow up after training, and training should be planned and formal. School effectiveness studies focus on the educational process itself rather than examining resources per se.

Hanushek (1995) claimed in his review for developing countries that school resources or inputs have no impact on student's achievements. Kremer (1995) argued for an alternative interpretation from the same studies that five of the six variables (teacher's education, experience, and salary; expenditure per pupil, and physical facilities) raised test scores. However, he noted that some have a small impact and the teacher pupil ratio has no positive effect. Heyneman and Loxley (1983) argue that the impact of school and teacher quality is greater than family socioeconomic status on student performance in developing countries compared to developed countries (Heyneman-Loxley effect).

Although results from the 1970s supported the claim, Baker, Gosling and Letendre (2002) and Hanushek and Luque (2003) do not find support in developing countries. In their study on schools, teachers, and educational income in developing countries Glewwe and Kremer (2006) describe the impact of additional resources inputs on educational achievements as mixed. Retrospective studies show limited impact while experiments and randomized trials, recently conducted in middle-income countries, show more mixed results. Good governance practices and reforms giving more autonomy to schools are better than giving incentives to teachers for improving student achievement.

The research findings from developed countries do not necessarily work for developing countries. Developing countries are very heterogeneous in nature and are not like industrialized countries. Each country has different socio-economic status, school practices, teachers, students, cultures, geography, and political systems. In-depth research at a country level, in context and with good data, is required to address the methodological and estimation problems.

Studies using TIMSS Dataset

Woessmann (2003a) studies educational production in East Asia based on international comparable micro level data collected from TIMSS 1995. Investigating

the influence of family background and schooling policies on students' achievements, he estimated education production function for each of the five highly performing counties (Japan, Korea, Hong Kong, Thailand, and Singapore). He found that resource allocation especially class size is not strongly related to student's achievements, more institutional schooling policies regarding school autonomy (Japan and Singapore), homework policy (Hong Kong, Japan and Singapore) might increase educational performance, and parents participation in the teaching process in Hong Kong gives superior achievements.

Exploring efficiency and equity in schools around the world, Hanushek and Luque (2003), used data from TIMSS 1995 on 37 countries, investigate the impact of resources policies such as improving teacher education or reducing class size on cognitive achievements both in developing and developed countries. Also, they test for Heyneman-Loxley effect in developing countries. They state that "across the sampled countries, the overall strength of resources in obtaining better student performance appears rather limited, but it is more positive than in the corresponding analyses of the US achievement." (Hanushek and Luque 2003: p497). Nonetheless, this variation is not specific to poor countries or countries that began with low levels of resources. They found that the Heyneman-Loxley effect, using alternative methods, does not hold.

To sum up, the existing literature on education production functions is ambiguous regarding the relationship between school resources and student achievements; institutional reform, school autonomy and accountability do appear to be important. Glewwe and Kremer (2006) argue that future EPF studies can improve results by increasing the sample size. TIMSS data set offers the opportunity for further research based on its comprehensive nature.

4.4 Empirical model

To assess the role of school and student background characteristics on performance we use a standard education production function (EPF) for test scores. For comparability it is important to consider country differences and avoid aggregation bias from pooling country data, so we estimate education production function for

each country separately. The EPF specification and variables is based on the literature and employs a common set of characteristics of student background and school resources to test their impact on cognitive achievements across MENA countries. The dependent variables are math test scores, using plausible values as discussed in the previous chapter. The literature suggests there are no or minimal effects of school resources on attainment so we explicitly test this; between school variation is examined by applying school fixed effects estimation across countries.

Given the presence of unobserved country-specific factors, a simple comparison of separate estimates for each country is not fully informative for identifying the most important determinants of educational attainment. To address this we use Meta regression analysis to investigate significant effects across countries: "Meta-analysis is the empirical analysis of all previously reported empirical estimates (or tests) on a given subject. It employs the same statistical tools available to any empirical researchers but has the advantage of a more comprehensive, more integrative perspective" (Stanley and Doucouliagos, 2010, p. 180) .

Meta-analysis is very common in medical research and recently in economic studies (Coric and Pugh 2008; Doucouliagos and Paldam 2008; Stanley 2001). The EPF and meta-regressions identify average effects of a variable for a sample. However, the effect of school or family characteristics may vary depending on (unobserved) student ability. One way of addressing this is quantile regressions, where the coefficient on explanatory variables is allowed to vary across the distribution of test scores. The three techniques employed are explained in more detail below.

4.4.1 **Education Production Function (EPF)**

We estimate an education production function of the following form:

$$A_{ics} = \beta_0 + \delta_1 F_{ics} + \delta_2 S_{cs} + \alpha D_{ics} + \varepsilon_{ics} \qquad \textbf{(4.1)}$$

Where A is the test score of student i in class c in school s *(MENA selected samples are different across countries. Some countries select only one class from each school, simplifying notation to students and schools only, and some select two classes.)*, F is a vector of family background variables and S is a vector of school characteristics variables. The

coefficient vectors α, δ_1 and δ_2 are to be estimated. We include D, a vector of dummy variables for each variable both in F and S to capture the effect of missing observations; a dummy takes the value 1 for observation with missing data and 0 otherwise (the variables themselves are set to zero if their values are missing). The error term ε has two components as we have a two-stage stratified sample, the imputation error on student's level and the sample error at the school level. Employing EPF on TIMSS data is complicated by the fact that TIMSS uses a two stage stratified sample and IRT (Item Response Theory) for performance measurement. This requires employing plausible values for the dependant variable and the jackknife technique to calculate the correct (robust) standard errors (as detailed in the previous chapter).

To control for differences across schools and estimate the pure effect of family and home on performance, we incorporate a school fixed effects estimate. The inclusion of dummy variables for school effect on the education production function gives the required fixed effect estimates.

4.4.2 **Meta Regression Analysis (MRA)**

To find the reliable determinants across countries we conduct a meta regression analysis. In this approach the key concern is whether there is a systematic effect of any given variable on the dependant variable and whether a significant effect remains after controlling for differences across studies. Meta regression analysis (MRA) is a statistical tool to synthesise the output of different studies to determine variables with systematic effects; following Stanley and Jarrell (1989) the specification takes the form:

$$f_j = \beta + \sum_{k=1}^{K} \alpha_k Z_{jk} + e_j \qquad (\mathrm{j} = 1,\ 2\ \ldots\ \mathrm{N}) \qquad \textbf{(4.2)}$$

Where the dependant variable, f_j is the estimated coefficients on variable j, β is the 'true value' of the coefficient across studies (N=8 MENA countries), Z_{jk} are the independent variables which control for any different characteristics across j, α_k is the meta regression coefficient which measures the biasing effect from variations in k, and e_j is the disturbance term. The heteroskedasticity of estimates requires

estimating a weighted least squares version of equation (4.2) by dividing through by estimated standard errors (SE_j) controlling for sample size differences to yield (4.3), where the dependant variable becomes the t-statistics of the estimates.

Weighted Least Squares MRA:

$$t_j = \beta_1 \left(\frac{1}{SE_j} \right) + \sum_{k=1}^{K} \alpha_k \frac{Z_{jk}}{SE_j} + \nu_j \qquad \textbf{(4.3)}$$

We conduct a meta-analysis to summarize and evaluate the findings from our comparative EPF estimates for MENA, based on a uniform analysis of the same specification based on comparable TIMSS 2007 data. The estimates from such analysis should not carry any systematic variation from outside the specification, such as different authors, publication, or different data so the Z_{jk} variables are dropped. The MRA accounts for differences or sources of bias across studies, making the application relatively simple. This analysis has the advantage of giving the required precision of the investigated effect over the normal vote-counting procedure. In vote-counting the effects are counted based on its direction and significance and do not account for sample differences. However, the estimates from equation (4.3) give us the average weighted impact of each variable across the sample and show which predictors are the consistent determinants of performance in MENA selected countries.

A meta-analysis will often be to estimate the overall or combined effect. If some studies were more precise than others we would want to assign more weight to the studies that carried more information. Rather than compute a simple mean of the effect sizes we compute a weighted mean, with more weight given to some studies and less weight given to others. There are two models used in meta-analysis to assign weights, the fixed effect model and the random effects model. The fixed effect model assumes that all studies in the meta-analysis share a common true effect size which means that all factors which could influence the effect size are the same in all the study populations, and therefore the effect size is the same in all the study populations. It follows that the observed effect size varies from one study to the next only because of the

random error inherent in each study. By contrast, the random effects model assumes that the studies were drawn from populations that differ from each other in ways that could impact on the treatment effect. It follows that the effect size will vary from one study to the next for two reasons. The first is random error within studies, as in the fixed effect model. The second is true variation in effect size from one study to the next (Borenstein et al. 2011). In here we employ the fixed effect meta-analysis as we estimate the same model for all countries. So we are expecting the same effect from all the studies, therefore different weights are assigned relative to the precession of the effect in each country.

4.4.3 **Quantile regression**

Our baseline model will be re-estimated using quantile regression to examine whether student background and school resources have different effects at various points of the achievement distribution. Following Buchinsky (1998), a simple quantile regression model can be written as

$$y_i = x_i\beta_\theta + u_{\theta i}, Quant_\theta(y_i \mid x_i) = x_i\beta_\theta \qquad (4.4)$$

Where $(y_i \mid x_i)$, $i=1,\ldots, n$ is a sample of population, y_i is the dependant variable and $\mathbf{x}_i$ is a $(k \otimes 1)$ vector of explanatory variables, $Quant_\theta\ (y_i \mid x_i)$ is the conditional quantile of y_i conditional on the vector of explanatory variables $\mathbf{x}_i$ and $\theta \in (0,1)$ assuming that $Quant_\theta\ (u_\theta \mid \mathbf{x}_i)=0$.

The θ^{th} conditional quantile regression estimator for β is obtained by the minimization of the weighted sum of absolute value of errors as in equation (4.5)

$$\min_{\beta}\left[\sum_{\{i;y_i \geq x_i\beta\}} \theta|y_i - x_i\beta| + \sum_{\{i;y_i < x_i\beta\}} (1-\theta)|y_i - x_i\beta|\right] \qquad (4.5)$$

Quantile regression will allow for the impact of explanatory variables on educational attainment to be analysed along the distribution. For example, the impact of parental education at the 25th quantile of the conditional test scores distribution might be compared and examined against the impact at the median and the 75th quantile, holding all other variables constant. Quantile regression will allow

us to check the robustness of our OLS estimates based on the errors distributions. QR is based on a weighted sum of absolute deviations which give a robust measure of location on the distribution scale (Buchinsky, 1998) Since TIMSS uses five plausible values for the test scores, we should repeat QR five times to get the correct estimates. We used the jackknife technique to calculate robust standard errors.

4.5 Results

Table 4.1 presents descriptive statistics on the student, family background and resource endowments of the schools. The descriptive are weighted by the sampling probabilities of each student to give a representative statistics for each country's population. The samples are rather evenly divided between boys and girls in each country. A rough comparison among the MENA countries, family background measures suggest a relatively high share of students from lowly educated backgrounds in Turkey, Tunisia, Syria, and Algeria, and a relatively large share of students from highly educated backgrounds in Egypt, Jordan and Saudi Arabia. The smallest class sizes in the country sample are observed in Iran with an average of about 27 students per class. In Egypt average class sizes are about 38 which the highest average in MENA. Male teachers are dominating the math teaching profession in Egypt, Iran and Tunisia. Except of Saudi Arabia, students in MENA countries attend schools with a large share of relatively disadvantaged students. Table 4.2 reports the results of the family background and school resources regression on maths scores for the different MENA countries. It shows measures of educational backgrounds of parents, followed by student characteristics, school-level measure including teacher background and school resources, and finally community location and poverty levels.

4.5.1 **Family backgrounds and student performance**

The education level attained by the parents is strongly related to student achievements in all MENA countries. The estimations use all the information available for the parents' education including dummy for each category:

Table 4.1: Descriptive statistics of Education Production Function variables

DV: Maths test scores	ALG		EGY		IRN		JOR		KSA		SYR		TUN		TUR	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Lower-sec EDC	0.26	0.44	0.23	0.42	0.25	0.43	0.08	0.27	0.16	0.37	0.24	0.43	0.24	0.43	0.49	0.50
Upper-sec	0.21	0.41	0.12	0.32	0.19	0.39	0.27	0.44	0.20	0.40	0.22	0.42	0.26	0.44	0.21	0.41
Post-sec not UNI	0.12	0.33	0.23	0.42	0.12	0.33	0.18	0.39	0.04	0.21	0.23	0.42	0.17	0.37	0.04	0.19
University degree	0.15	0.35	0.20	0.40	0.14	0.35	0.30	0.46	0.32	0.47	0.15	0.35	0.13	0.33	0.09	0.28
Natives	-	-	0.81	0.39	0.96	0.19	0.65	0.48	0.74	0.44	0.83	0.37	0.91	0.29	0.96	0.20
One bookcases	0.16	0.37	0.24	0.43	0.18	0.39	0.30	0.46	0.25	0.43	0.22	0.42	0.21	0.41	0.24	0.43
Two bookcases	0.06	0.24	0.12	0.33	0.15	0.35	0.19	0.39	0.17	0.37	0.12	0.32	0.08	0.27	0.15	0.36
Home possess H	0.32	0.47	0.39	0.49	0.34	0.47	0.50	0.50	0.45	0.50	0.33	0.47	0.34	0.47	0.36	0.48
Home possess M	0.50	0.50	0.39	0.49	0.36	0.48	0.38	0.48	0.36	0.48	0.45	0.50	0.46	0.50	0.50	0.50
Boy Student	0.51	0.50	0.51	0.50	0.55	0.50	0.47	0.50	0.47	0.50	0.49	0.50	0.48	0.50	0.53	0.50
TL spoken ALs	0.39	0.49	0.61	0.49	0.57	0.50	0.74	0.44	0.61	0.49	0.72	0.45	0.08	0.28	0.76	0.43
PC at H&SCL	0.05	0.23	0.27	0.45	0.06	0.23	0.54	0.50	0.16	0.37	0.35	0.48	0.03	0.17	0.27	0.45
PC at H/SCL	0.30	0.46	0.53	0.50	0.35	0.48	0.37	0.48	0.58	0.49	0.44	0.50	0.44	0.50	0.54	0.50
Male teacher	0.57	0.50	0.73	0.45	0.60	0.49	0.45	0.50	0.45	0.50	0.44	0.50	0.63	0.48	0.56	0.50
T. Experience	16.45	10.13	12.64	8.52	15.40	9.34	9.32	7.72	9.76	7.02	11.22	8.91	10.82	9.33	9.91	9.34
T. Certificate	0.58	0.49	0.69	0.46	-	-	0.79	0.41	-	-	0.79	0.41	0.82	0.39	1.00	0.06
M SCL RCS	0.76	0.43	0.56	0.50	0.70	0.46	0.71	0.46	0.73	0.44	0.79	0.41	0.71	0.45	0.66	0.47
L SCL RSC	0.08	0.27	0.05	0.21	0.15	0.35	0.06	0.24	0.15	0.36	0.05	0.21	0.22	0.42	0.25	0.43
T. UNI Degree	0.13	0.34	0.88	0.33	0.50	0.50	0.90	0.30	0.92	0.27	0.44	0.50	0.93	0.26	0.75	0.44
COMMU.>50000	0.44	0.50	0.53	0.50	0.61	0.49	0.49	0.50	0.54	0.50	0.46	0.50	0.26	0.44	0.70	0.46
Pov 50% Disadv	0.47	0.50	0.42	0.49	0.42	0.49	0.40	0.49	0.17	0.38	0.46	0.50	0.48	0.50	0.63	0.48
Class size	31.28	15.30	37.68	10.90	26.75	6.57	36.74	10.81	29.61	19.37	31.70	10.24	29.19	10.66	33.68	13.25

(Sampling weights applied for all countries)

Table 4.2: Determinants of education in MENA, Education Production Function estimates

DV: Maths test scores	Saudi Arabia		Algeria		Egypt		Syria		Iran		Tunisia		Jordan		Turkey	
	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Lower-sec EDC	0.19	5.41	-6.522**	2.88	7.33	5.97	0.52	6.69	2.38	4.24	-11.19***	3.97	-4.10	9.38	7.72	4.89
Upper-sec	-0.81	4.73	2.96	2.89	22.88***	6.42	-6.62	6.48	14.28***	5.13	-7.802*	4.16	11.33*	6.73	31.07***	6.50
Post-sec not UNI	15.27	9.88	5.60	3.74	33.79***	7.02	15.58**	6.79	17.84**	8.17	1.34	4.74	40.83***	8.05	45.26***	10.29
University degree	18.62***	5.81	0.10	3.48	3.11	6.88	20.34**	7.94	36.62***	8.39	10.72**	5.15	34.89***	7.43	88.34***	10.73
Natives	-10.13**	5.05	-	-	48.86***	5.11	19.47***	5.65	20.55**	9.78	24.27***	5.63	-5.93	3.69	42.29***	8.84
One bookcases	14.31***	5.12	11.44***	2.72	10.57**	4.32	6.226*	3.40	21.36***	3.95	17.94***	3.12	14.70***	4.67	25.29***	3.71
Two bookcases	9.070*	4.82	5.61	4.48	2.14	6.33	1.57	4.43	10.86*	5.77	33.64***	4.51	20.60***	5.48	27.25***	5.74
Home possess H	51.24***	4.94	16.44***	4.23	58.99***	5.30	41.03***	5.27	13.71*	7.72	35.38***	5.04	57.03***	7.00	28.44***	8.94
Home possess M	24.93***	4.56	14.21***	3.70	41.22***	4.77	29.22***	4.90	11.67***	4.00	15.90***	3.83	48.53***	5.88	18.29***	6.41
Boy Student	-10.90	12.79	6.845***	1.79	-10.65*	5.50	18.66***	5.56	5.59	11.38	22.58***	2.06	-20.74	22.71	7.852**	3.55
TL spoken ALs	-4.14	3.44	0.72	2.12	-20.12***	3.76	2.94	4.98	12.90***	4.57	-15.46***	4.32	-11.05**	4.81	28.68***	4.61
PC at H&SCL	-15.39**	6.19	-14.21***	4.61	-26.32***	5.17	-13.02**	5.48	73.64***	22.14	-31.44***	6.67	1.59	7.56	31.77***	8.44
PC at H/SCL	-13.64***	3.95	-3.28	2.99	-23.78***	4.30	-13.52***	5.07	14.90**	6.34	-11.65***	2.72	-22.42***	7.22	12.74**	6.49
Male teacher	-5.20	12.61	4.65	4.05	1.42	7.54	0.30	7.37	-8.26	11.99	-5.06	3.24	4.02	23.10	9.27	7.50
T. Experience	0.13	0.33	-0.32	0.29	1.008***	0.36	0.36	0.47	0.17	0.37	0.473**	0.20	0.60	0.54	0.74	0.71
T. Certificate	-	-	3.75	3.87	8.14	9.66	-7.93	9.36	-	-	2.44	5.94	1.79	9.74	27.27	27.59
M SCL RCS	-10.81	10.79	-2.97	6.54	-5.15	7.12	10.60	13.86	-18.06*	9.82	-1.34	5.82	-7.97	10.28	-25.61**	11.63
L SCL RSC	-17.33	12.17	0.55	8.67	-22.65	14.26	12.83	20.43	-26.88**	11.03	-2.01	6.99	-2.64	14.99	-34.26**	13.48
T. UNI Degree	-13.53	17.51	-2.87	5.33	0.08	21.17	10.24	6.99	3.30	5.17	-5.33	7.98	12.30	17.28	6.93	15.88
COMMU.>50000	14.55***	4.63	1.39	3.36	10.45	6.55	-6.34	8.80	16.88**	6.92	0.16	3.27	20.96***	7.63	17.42**	8.16
Pov 50% Disadv	-3.83	5.59	1.27	3.93	-9.18	5.92	-23.16***	8.30	-10.59*	5.82	-8.081**	3.66	-15.67*	9.21	-31.69***	8.97
Class size	-0.59	0.56	1.702*	0.93	-0.69	1.34	-3.41	3.11	-0.46	2.01	-4.537***	1.28	-0.91	2.18	-0.14	1.41
Class size Sq	0.01	0.01	-0.02	0.02	0.00	0.02	0.05	0.05	0.01	0.04	0.104***	0.03	-0.01	0.03	0.00	0.02
Constant	346.3***	25.97	336.9***	16.23	351.3***	32.21	409.0***	52.53	365.1***	25.95	417.8***	-22.25	412.9***	49.40	304.4***	44.93

(Jackknife standard errors, p<0.01, p<0.05, p<0.1 & dummy controls for missing values included)

namely parents whose highest education level is lower secondary, finished upper secondary, some post-secondary education, and finished university, with parents with no secondary education (i.e. no, or no more than, primary) as reference category.

Across MENA countries, the relationship between student's maths performance and parents' level of education is weak in Algeria and Saudi Arabia and non-monotonic in Jordan and Egypt. There are two countries, Algeria and Egypt, where the difference in maths performance between students whose parents finished university and students whose parents did not finish lower secondary education is not statistically significant. However, in Algeria, students whose parents finished lower secondary education have significantly lower performance in math compared to students whose parents had no lower secondary education. In Egypt, students whose parent had finished upper secondary or some post-secondary education perform statistically better than student whose parents had no lower secondary education. In Tunisia, Students whose parents have lower or upper secondary education are doing worse than those students whose parents have no education or did not finish primary stage. The same case is for lower secondary education level parents. These two results could not be explained from the data we have. The only suggestion is that it might be the parents' ability who affected their path to more schooling compared to poverty reasons to leave school for non- educated parents. Heritable ability has been to be a likely source of intergenerational correlations between parents and children (Behrman and Rosenzweig 2002; Behrman et al. 1999).

At the other extreme, the difference is the largest in Turkey at 88.34 point of test scores in favour of student whose parents had a university degree compared to student whose parent had no secondary education. The effect size in both Jordan (35) and Iran (37) is quite close to the observed effect in Western European countries and below the United States observed effect (52 points [but this must be in comparison to a higher average so proportionally will be quite similar]) (Woessmann 2005b).

The second indicator of family background measures is number of bookcases in the student's home. That measure will be correlated with parental education and both will be correlated with other unobserved family characteristics such as ability, motivation and capability to help children at home with respect to school matters. Each student was asked in TIMSS questionnaire to report the total number of bookcases at their home, excluding newspapers, magazines or school books. These two indicators act as proxies of socio-economic and educational background of student. This measure was included in three categories; has two or more bookcases at home, one bookcase and the reference category of very little or no books at home. Again, Algeria, Egypt and Syria show insignificant effect of homes with more than two bookcases compared to homes with very little or no books. Tunisia has the largest effect with Turkey in second place, with students from home with two bookcases performing better in maths test by 33.64 and 27.25 points respectively. The effect of homes with one bookcase is statistically significant across all countries; the lowest effect is for Syria, Egypt, and Algeria. The books effect for Tunisia and Turkey is quite similar to the effect in Europe where the number of books increases the performance monotonically. Turkey and Tunisia are the only two countries in MENA who adopt a secular political system and they are quite mixed and closely related to the Europe which suggests some sort of culture impact.

Native students outperform non-natives in all countries except in Saudi Arabia where students with Saudi parents do worse by 10 significant points than non-Saudis (Algeria sampled 100% Algerian students in their sample and the effect of native parents was insignificant in Jordan). Home possessions are measured by an index of three categories, namely high, medium and low home possessions. Each student was asked to report if they have certain items at their home, then an index is constructed using this information[20]. Home possessions being high or medium show the expected significant positive effect on maths performance in all countries. The largest effect size is in Egypt and Jordan followed by Saudi Arabia and Syria and the lowest effect size was in Iran where students who have high home

[20] Both average index and factor analysis index were introduced with no differences, so for comparability and simplicity we included the average index.

possession do better by 13.7 point test score in maths compared to student with low home possessions.

Student's gender indicated a significant different effect between boys and girls, where boys outperform girls in Algeria, Syria, Tunisia, and Turkey and girls outperform in Egypt, the effect was insignificant in Saudi Arabia, Iran, and Jordan. Though, the school fixed effects estimates indicate the sign of this coefficient is consistent across countries. This result will be further investigated in the next chapter.

Students were asked if they use a computer at home and school, at home but not school, at school but not at home, other places, or no computer at all. Computer usage is re-categorized into three groups; using computer both at home and school, either at home or school, and the reference group is no computer to measure the effect of using computer under supervision compared to no computer or using it without supervision.[21] Students who use a computer perform worse (statistically significant) than students who do not use computer at home or school in all MENA countries except in Iran and Turkey. This surprising result will be discussed later. The largest effect is in Iran where a student who uses computer both at home and school performs better by 73.6 point test score in maths.

The computer usage without enough and well prepared curricula and teacher will be a waste of time and resources. The Turkish model would help to show why computers increase achievements compared to the negative impact in other countries. This finding is not uniquely for MENA countries, similar effect found in Romania where introducing computers at school make the students perform worse (Malamud and Pop-Eleches 2011). The reason was that computers benefit more if the curricula include applications and research using computers. Another problem might be the need to internet connection with computers besides learning a universal language at early age to help benefit more of computer usage.

[21] The full classification and comparison of using computer is further explored for Egypt.

With respect to test language and home spoken language, student was asked to report how frequently the test language is spoken at home. Test language always spoken at home affected student performance in math significantly negatively in Egypt, Tunisia, and Jordan; the effect significantly increases test scores in both Iran and Turkey.

4.5.2 **School resources, teacher characteristics and performance**

This section presents the results for school resources and location represented in equation (4.1) by the vector $\boldsymbol{S}$ which contains measures of teacher characteristics including: teacher gender, teaching experience, teaching certificate, teacher's level of education; school resources availability, class size, and some other location measures (community type if the population is greater than 50000 person and poverty measure of catchment area of the school by percentage of disadvantage students who attend this school).

Teacher characteristics do not make a difference for student performance in MENA countries except for teaching experience in Egypt and Tunisia. However, the effect is very small, a one year more of teaching experience increases student's maths test scores by 1 point in Egypt and less than half point in Tunisia.

School resources availability is measured by an index of required components for schooling and teaching different subjects classified into high, medium, and low. School principals were asked to report the level of these resources in their schools. The impact of a shortage in school resources is found to be statistically significant in only Iran and Turkey. Students who attend a school where resources availability was medium performed worse than students who attend a high resources availability school by 18 point test scores in Iran and quarter standard deviation of math test scores in Turkey. The effect size increases the gap if the student attends a school with low level of resources.

The results indicate the effect of school on student performance is only significant in two MENA countries, Iran and Turkey. Form a policy perspective this would imply that increasing resources availability in the two countries will increase maths

performance substantially, but begs the question of why school resources shortages do not make any difference on student performance in the other MENA countries.

For class size, a measure of number of students in the class and the class size squared are used. Across MENA, one class from each sampled school is chosen in TIMSS except in Tunisia where two classes are chosen to fulfil the sample requirements. The class size effect features in the literature of school resources effect on student performance, with no general agreement on the effect. For MENA countries, class size has a statistically significant effect only for Algeria and Tunisia. The effect is different for the two countries; a larger class increases maths performance in Algeria but reduces scores in Tunisia (class size may increase performance after some point but by a very small amount, implied from the class size squared effect).

School community, the school external environment, might have an effect on students' performance. A school located where the community population is more than 50,000 increases student maths performance in Saudi Arabia, Iran, and Turkey. This measure could be viewed as a proxy for community classification into urban or rural. The results indicate a more positive impact on student performance in urban communities compared to students who attend a school in less populated communities. The other important measure of school environment is whether the school is located in a poor or affluent community. Students who attend school where most of students are disadvantaged or poor perform worse than students who attend more affluent students' schools. The effect is significant in Syria, Iran, Tunisia, and Turkey.

There is in essence little positive relationship between student performance and more of the measured school resources variables in MENA. These findings go in line with the previous research in economics of education field that found no strong or systematic relationship between larger school resources and student performance in both developed and developing countries (Hanushek 1995; Hanushek 2003; Hanushek and Luque 2003; Hanushek and Rivkin 1997; Woessmann 2003a).

4.5.2.1 School fixed effects

A specification that includes a whole set of school dummies to control for school fixed effects (SFE) is employed to estimate the education production functions of MENA countries. Any systematic between-school variation stemming from any source is thereby removed when estimating the family background and student characteristics effects. However, controlling for school fixed-effects means that we are unable to explore the effect of school-level determinants of learning such as school resources, teachers' qualifications and class size. It gives finer estimates for the impact of student level variables.

The school fixed effect estimates (Appendix Table A-4.10) do not show major differences from the baseline model. As expected the explanatory power of the SFE model is higher than the full model (Table A-4.9). The changes mostly related to estimate for Iran, controlling for any unobservable from the school side variables by SFE changes the majority of home background and student characteristics indicators effects. Native students, home spoken language, computer usage at home or school, and more books at home turn to be insignificant, whereas the gender indicator shows a significant effect in favour of boys.

4.5.3 **Meta-Analysis results**

The variations present in the baseline results of the education production functions in MENA with this uniform analysis do not provide a general view of determinants of education; one way to do this is by "vote counting" for each of the variables. Column 2 of Table 4.3 shows the number of significant effects for each of the variables and determines the effect direction being positive or negative.

Then, by the majority in either case, a variable is judged to have positive or negative effect. It is a superficial method since it doesn't account for the difference between the effect sample size and standard error. The alternative is to use meta-analysis introduced in the previous section. Table 4.3 also shows the results of the meta-regression analysis. The last column shows un-weighted effect of average coefficient to compare with MRA weighted estimates. The MRA results indicate dominance of home background and family (SES) effects on students' performance in maths

across MENA. The fourteen significant indicators of educational determinants on student performance are presented using forest plots(Lewis and Clarke 2001) displaying an inverse-variance weighted fixed effect meta-analysis Figures 4.4 to 4.7.

Table 4.3: Meta-Analysis of the determinants of maths achievements for MENA

DV: t-statistics of the coefficient estimates	Meta-regression analysis (FE)		Vote-counting		Average un-weighted effect
	Coef.	se	Pos. (sig)	Neg. (sig)	average coefficient
Lower-sec EDC	-2.289	(2.429)	5(0)	3(2)	-0.41
Upper-sec	5.110	(4.141)	5(4)	3(1)	8.54
Post-sec not UNI	14.41**	(5.331)	8(5)	-	22.17
University degree	14.54*	(7.245)	8(6)	-	26.87
Native parents[!]	13.88	(8.265)	5(5)	2(1)	17.31
One bookcases	14.90***	(2.206)	8(8)	-	15.28
Two bookcases	13.69**	(4.368)	8(5)	-	13.78
Home possess H	37.80***	(6.073)	8(8)	-	37.73
Home possess M	22.73***	(4.374)	8(8)	-	25.43
Boy Student	11.63**	(3.483)	5(4)	3(1)	2.44
TL spoken ALs	-1.398	(4.703)	4(2)	4(3)	-0.69
PC at H&SCL	-12.78*	(6.653)	3(2)	5(5)	0.87
PC at H/SCL	-9.302**	(3.801)	2(2)	6(5)	-7.62
Male teacher	-0.152	(1.915)	5	3	0.17
T. Experience	0.352**	(0.149)	7(2)	1	0.41
T. Certificate[!]	2.595	(2.044)	5	1	4.12
M SCL RCS	-6.099*	(2.854)	1	7(2)	-7.76
L SCL RSC	-9.786*	(4.830)	2	6(2)	-11.43
T. UNI Degree	1.664	(1.631)	5	3	2.57
COMMU.>50000	6.243*	(2.977)	7(4)	1	9.38
Pov 50% Dis-adv	-8.029**	(3.069)	1	7(5)	-12.70
Class size	-0.586	(0.601)	1(1)	7(1)	-1.14
Class size sq	0.00564	(0.00691)	5(1)	3	0.02

! No. of observation for native parents is 7 [no Algeria] and teaching certificate is 6 [no Saudi Arabia and Iran]

4.5.3.1 The home influence on performance:

The influence of home background, socio-economic status and parents' education is very clear across MENA countries from the meta-analysis. Nine indicators show significant impact on math performance in the meta-analysis; parents level of education (post-secondary but not university and university degree or higher), level of home possessions (high or medium), number of books at student home (one or more than two book cases) as a proxy for SES, student gender, and computer usage (used both at home and school or used only at one place; home or school).

The significant effects of the family indicators on student performance from the meta-analysis are positive in all indicators except for computer usage. Figure 4-4 and Figure 4-5 exhibit the forest plot of these indicators. The forest plot figures show the heterogeneity among the indicator effect across countries.

Figure 4-4: Forest plot displaying an inverse-variance weighted fixed effect meta-analysis for the effect of education determinants on student performance

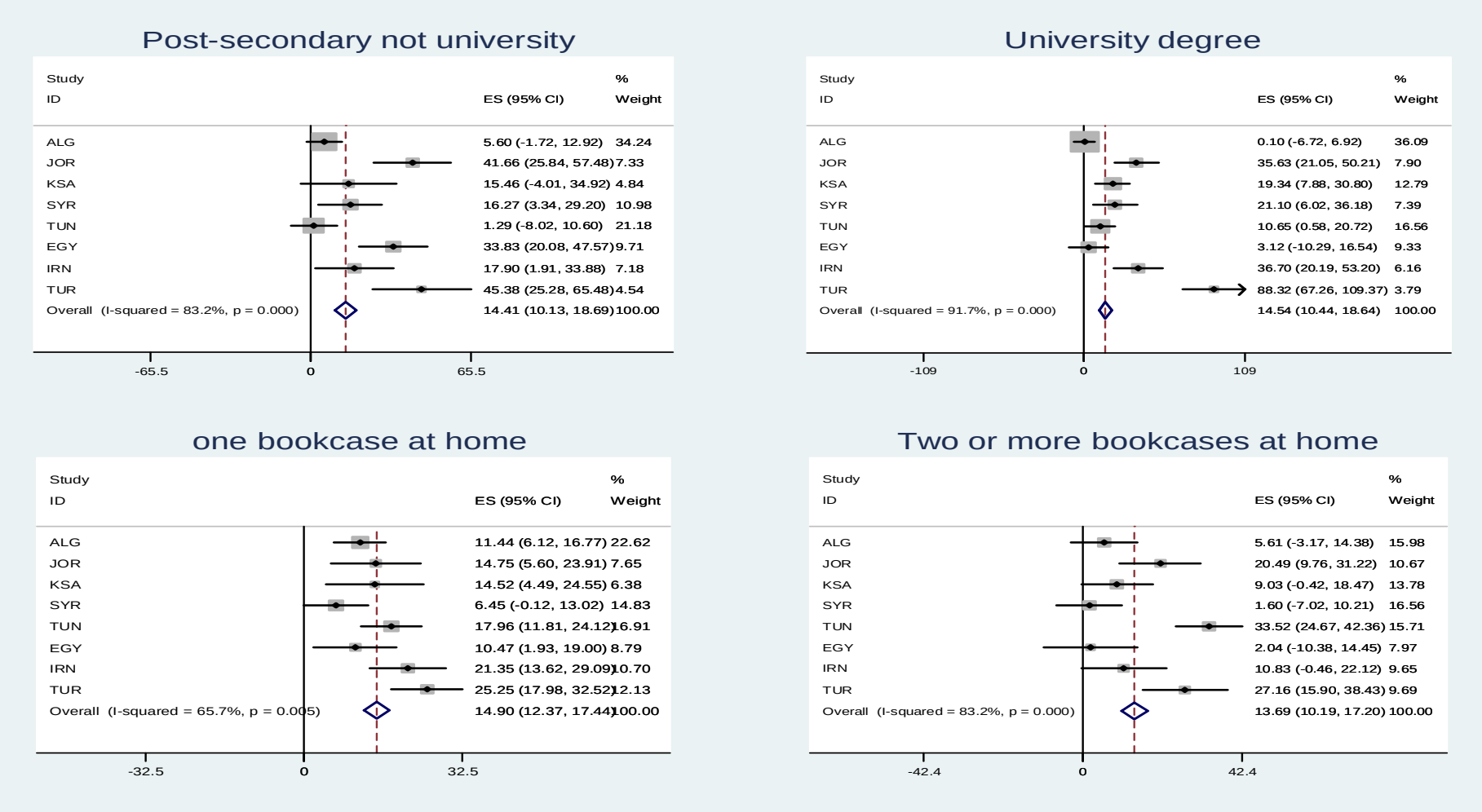


Figure 4-5: Forest plot displaying an inverse-variance weighted fixed effect meta-analysis for the effect of education determinants on student performance

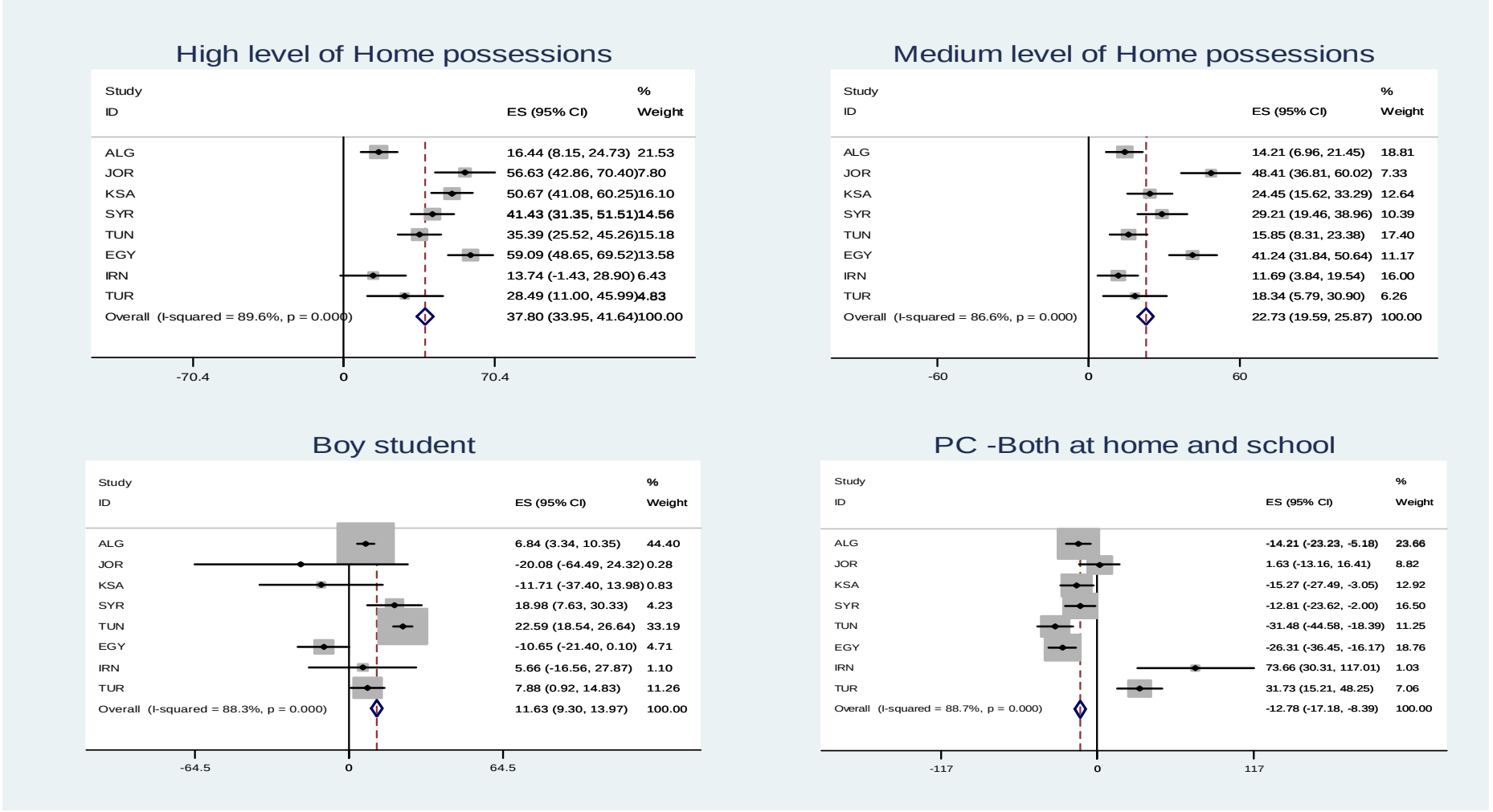


Figure 4-6: Forest plot displaying an inverse-variance weighted fixed effect meta-analysis for the effect of education determinants on student performance

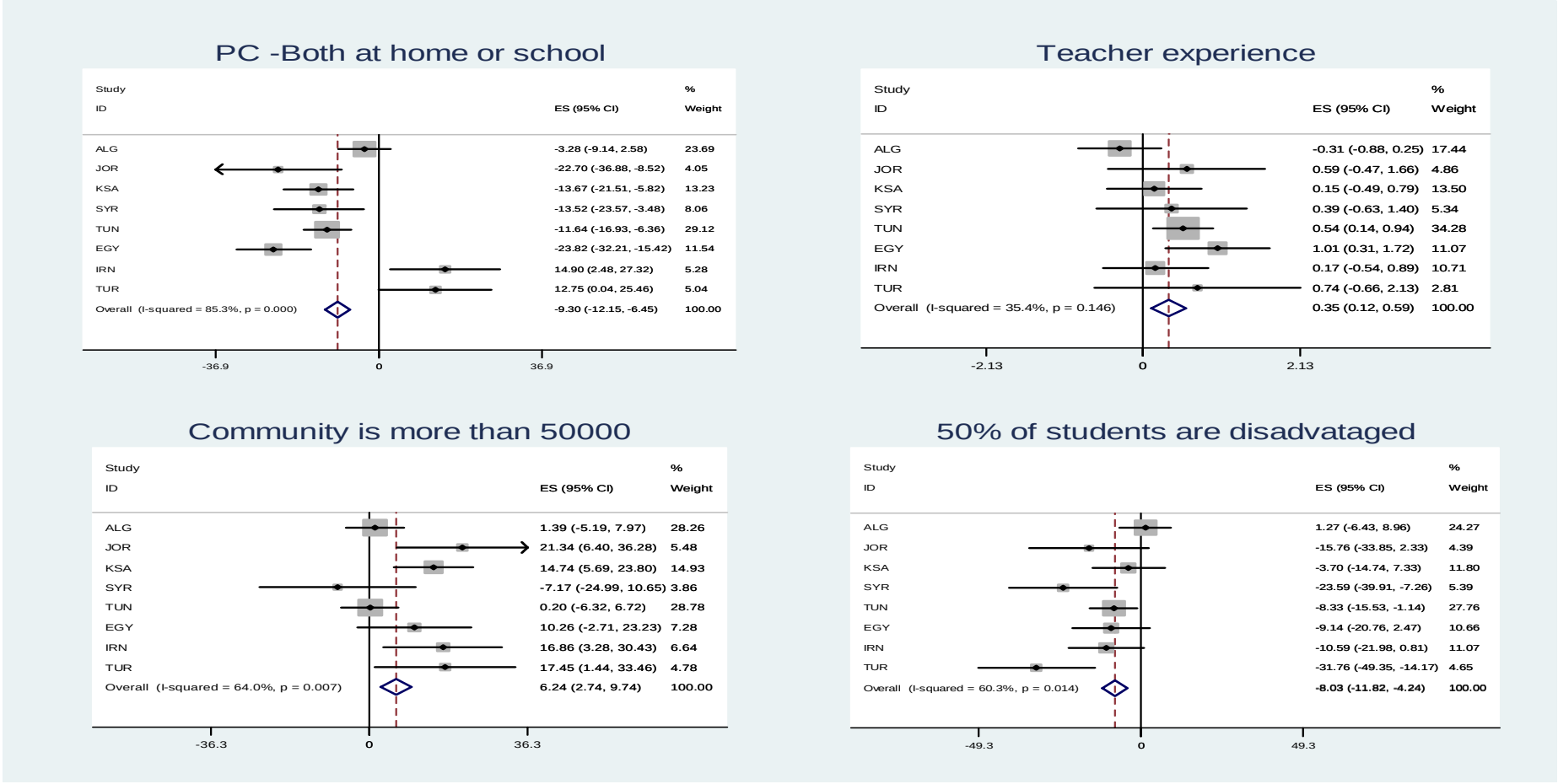
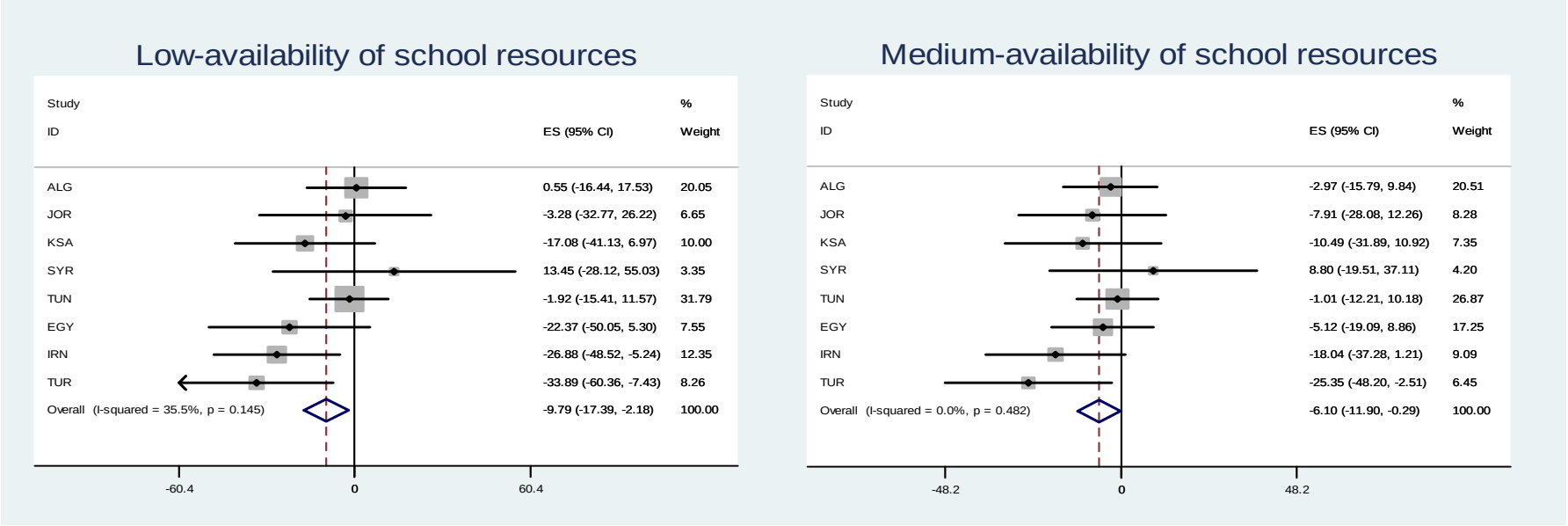


Figure 4-7: Forest plot displaying an inverse-variance weighted fixed effect meta-analysis for the effect of education determinants on student performance



Notes for Figures 3.4 to 3.7: The dotted line represent the average effect, the diamond shape ◇is the effect size and confidence interval, the solid line is the no effect line and the grey box ■ is the effect from each study and its size represent its weight in the overall effect. The heterogeneity test, I-squared value, represents the percentage of variation across studies attributable to heterogeneity (Harris et al. 2008). The value of I^2 ranges between 0 (no heterogeneity) to 100%. The estimates of I-squared of all family indicators are high, indicating large variation in the true effects across MENA countries. The p-value of the I-squared test is less important in small studies meta-analysis; however a visual inspection of confidence intervals overlapping is of more importance. The effects are regarded as homogenous if the confidence intervals of all the studies overlap. Nonetheless, larger CI implies an imprecise effect.

4.5.3.2 Computer usage reduces performance

The impact of using computers in MENA reduces maths test scores. The aggregate effect of computer usage on maths scores is statistically significant with negative effect. The forest plot shows that this effect has two exceptions, Iran and Turkey, where the effect is positive for the two indicators of computer usage.

Descriptive statistics of computer usage categories across MENA indicates large differences (Table A.2 in the appendix). Considering the two countries with positive effect of computer usage on performance, Iran and Turkey show large differences on the reference group (not using computer at all) shares; Iran more than 45% of the sample do not use computer at all but in Turkey only 4% do not use computer at all. Running regression over the full range of categories does not show much difference.

4.5.3.3 The school influence on performance

The school level variables are mostly insignificant in country context, whereas the meta-analysis indicates general significant effects for teacher's experience, school resources, poverty, and school location on performance. The largest effect is for school resources followed by poverty and community type variables.

Teacher experience increases maths scores by 0.35 point, the effect size mainly driven by Tunisia and Egypt. The heterogeneity test is insignificant (I-squared value) which means 35% of the observed variances between studies is due to real differences in the effect size across countries of low resources. The medium and low school resources affects student attainment in maths negatively compared to students who attend schools with higher school resources. The negative effect size is mainly driven by the large significant effects in Iran and Turkey. The urban community effect size is increasing maths scores as expected but the heterogeneity is too large (64%) with a p–value of 0.007. As explained above the p-value is not of much power in heterogeneity test with small sample of studies which means one cannot assume homogeneity. The effect size is based on the significant effect in Saudi Arabia, Iran, Jordan and Turkey. Students in disadvantaged areas will attain less in maths by 8 points on average; the heterogeneity test is significant (i.e. we reject the null of heterogeneity).

4.5.4 **Quantile Regressions:** *Heterogeneity of Covariates Effects by Performance (ability)*

The quantile regression model allows estimating the entire conditional distribution of Y given X. A more complete picture of student characteristics, home background, teachers' characteristics and school inputs effects can be provided by conditional quantile estimations. The estimates are focused on three quantiles .25, .50 and .75. The dependent variable is maths test scores. Sampling weights are employed and jackknife standard errors are reported as shown earlier.

The estimates of the uniform quantile analysis across MENA countries indicate some differences across test scores distributions. Table 4.4 presents a summary of the quantile estimates, the full estimates are in Appendix Tables A3.1 to A3.8. For student and family background; parents' level of education show large effect differences across quantiles compared to average effects in most of the countries. The home possessions effect is persistent across quantiles for all MENA countries except at top quantile for Iran and Turkey and median for Iran. The computer usage (both home and school) indicates different effects across quantiles for Saudi Arabia, Algeria and Syria. For School inputs and location; teacher experience effect has changed at the median in Egypt and appears to have no effect at all quantiles in Tunisia. The level of school resources availability for maths teaching effect remains for lower and median in Iran and Turkey but not at the top. The community effect is insignificant at the lower quantile in Jordan and both lower and median in Turkey. The poverty effect is insignificant at the median and top quantiles in Iran and at the lower and top quantiles in Jordan.

There are two main findings that might be of policy interest; the school resources effects and computer usage. The school resources, as shown in OLS estimates, affects the performance negatively in Iran and Turkey if it is below the highest level of availability. The quantile estimates clearly show that the effect is only present at the lower and median quantiles in both countries which could be interpreted as targeting the low and medium resources school and increasing the availability of resources would achieve improvement for low performing students.

Table 4.4: Quantile Regression Results Summary for MENA

DV: math scores (5pv)	SAUDI			ALGERIA			EGYPT			SYRIA			IRAN			TUNISIA			JORDAN			TURKEY		
	.25	.50	.75	.25	.50	.75	.25	.50	.75	.25	.50	.75	.25	.50	.75	.25	.50	.75	.25	.50	.75	.25	.50	.75
Lower-sec EDC																		-						
Upper-sec							+	+	+					+	+							+	+	+
Post-sec not UNI							+	+	+			+		+	+				+	+	+	+	+	+
University degree		+	+									+	+	+	+		+		+	+	+	+	+	+
Native parents				na	na	na	+	+	+	+	+		+			+	+	+			-	+	+	+
One bookcases			+		+	+			+				+	+	+	+	+	+			+	+	+	+
Two bookcases														+		+	+	+		+	+	+	+	+
Home possess H	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	
Home possess M	+	+	+	+	+	+	+	+	+	+	+	+	+				+	+	+	+	+	+	+	
Boy Student				+	+						+	+				+	+	+						+
TL spoken ALs							-	-	-				+	+			-	-				+	+	+
PC at H&SCL	-				-		-	-	-		-	-	+	+	+	-	-	-				+	+	+
PC at H/SCL	-	-					-	-	-		-				+		-	-	-	-				
Male teacher																								
T. Experience							+		+															
T. Certificate	na	na	na										na	na	na									
M SCL RCS													-	-								-	-	
L SCL RSC													-	-								-	-	
T. UNI Degree																								
COMMU.>50000	+	+	+										+	+	+					+	+			+
Pov 50% Disadv										-	-	-	-							-		-	-	-
Class size						+											-	-						
Class size Sq																+	+	+						

Note: (+) indicate positive effect, (-) negative effect and (na) not available data for this variable so excluded.

On the other hand, this finding confirms the insignificant effect of school resources in other MENA countries which might be investigated more from the curriculum point of view. The computer usage works in the same way as school resources, however it significantly reduces the attainment of students in all countries except Iran and Turkey.

The median regression can be viewed as a test of the ordinary least squared results for robustness against outliers. The conditional quantile function at the median minimizes the sum of absolute residuals which is less sensitive to outliers than OLS. In this logic, median regressions may be better depicting the central tendency of the data. As shown from Table 4.4, in most countries the mean and the median are parallel. Nevertheless, some country estimates do differ between mean and median suggesting biasness due to outliers. For example, home possessions estimates are slightly larger at the median than the average OLS estimates which seems to be a downward bias of the mean estimates.

A more detailed investigation of the quantile regressions reveals more variations along the maths scores distribution. For Saudi Arabia, a parent with university education affects achievements at the median and top quantiles by 18 and 22 points increase of maths test scores (Appendix Table A-3.1) but not at the lower. Number of books at home is significant only at top quantile for one bookcase. Computer usage (both at home and school) is significantly reducing performance at the lower quantile and at median for using at home or school.

For Algeria, student in a home with one bookcase would achieve more at median and top quantile. Home possessions as proxy for wealth affect performance positively along the distribution; a wealthy family's (high home possessions) effect decreases across quantiles, however it increases for the medium home possessions across quantiles.

For Egypt, the effects are parallel to the average estimates except for the student gender effect which is insignificant across quantiles and the number of books at home effect which is significant only at the top quantile for one book case.

For Syria, parents education is only significant at the top quantile, explained as more variation across students' ability distribution. The negative effects of computer usage are insignificant at the lower quantile indicating more variations. The deleterious impact of poor community (% of disadvantaged students at school) becomes more accentuated as one move up the distribution which suggests a policy intervention in those poor societies will benefit the good as well as the low performers.

For Iran, the home possessions effect (high or medium) is only significant at the lower quantile, perhaps reflecting a sense of inequity due to home possessions. The other significant change is for school resources at the top quantile, a medium or low school resources would not make any differences of the achievements of top ability student but would significantly reduce the scores of lower and medium ability student. The computer usage increases performance toward the top of the distribution. The impact of parental education becomes stronger as one move up the distribution, as does the positive impact of home computer use. Those results indicate more involvement of parents is needed to the less achiever.

For Tunisia, a top ability student would suffer with less educated parents by 14 points less. A medium wealth family would affect student performance at median and top quantile but cannot rescue a low ability student. Computer usage tend to affect the performance along the distribution with increasing rate toward the top performers, however using computer either at home or school does not affect low ability students. The poverty effect tends to be insignificant in quantile analysis compared to least squared analysis. Class size effect with quadratic term indicating an inverted U-shaped relation where the class size increase affects performance negatively till the class size of 21 then it tend to increase performance. A note worth mentioning here is that Tunisia sampled two classes from some schools.

For Jordan, books at home benefit the top performers and more books would benefit the medium and the top performers. Computer usage negatively affects students at the lower and median when used either at home or at school. The large community

affect the median and top performers rather than the low ability students. The poverty effect is insignificant at the lower and the median.

For Turkey, the effects are almost the same across the distribution except for the wealth, school resources, gender and large community indicators. Home possessions and school resources affects the students with lower ability rather than top ability students however the effect works against each other. Gender differences and large community effects are significant only at the top quantile. The impact of poor school resources affect the less a wears off as one goes up the distribution, suggesting more negative influence on students with low abilities. A policy intervention to raise such poor resources will help those students to move up on the distribution.

4.6 Conclusion

This chapter investigates education production functions for students in eight MENA countries school systems. Using TIMSS dataset to identify the determinants of educational achievement (measured as test scores in Maths), what all of the countries have in common is relatively low test scores, compared to other countries of similar income for which TIMSS data are available. Whilst it is not possible to explain why these countries have low scores by global standards we try to draw some inferences by identifying factors that explain differences in performance across students in each country.

The results presented here are the first concrete evidence on educational production functions for the most of MENA countries. The broad evidence is of very low returns to schooling- few school variables are significant and none have effects across countries and quantiles. Two broad types of factors were distinguished: student characteristics including home environment (e.g. gender, parental education, home resources) and school resources (e.g. class size, teacher experience, IT equipment). In general, student characteristics were far more important than school factors in explaining test scores, but there was considerable variability across countries in which specific factors were significant. Certain factors that appeared

important in countries with relatively high scores, such as Turkey, were either insignificant or had very low coefficients (small effects) in the other countries so these help account for the low performance.

The meta-regression analysis indicates some common factors and indentifies some variations between MENA countries with respect to those significant influences. Family background proxies, parental education and number of books at home seem to present the largest effect on student's performance in maths in the three top performing countries, Tunisia, Jordan and Turkey. The number of books effect was the lowest in Egypt and Syria. Home possessions are the most consistent effect across MENA countries. The gender differences of maths performance are significant in MENA, though a lot of variation is notable. In some countries boys do better (Algeria, Syria and Tunisia) whereas in other girls do better (Jordan, Egypt, and Saudi Arabia). Further investigation regarding gender differences would clarify the sources of such gap (see chapter 4).

One striking finding is the effect of computer usage on student's maths performance in MENA countries. Computer usage is found to influence student performance negatively in six MENA countries. Only Turkey and Iran are found to have a significant positive effect of computer usage on maths achievements. The computer usage finding has more solid evidence in Turkey where a bigger share of students use computer compared to Iran. This result suggests the importance of directive usage of ICT both at home and school to improve performance; it is not only the availability of ICT which will push the performance up. This begs questions about how computers have been used in those countries compared to Turkey.

In terms of school level effects, there is not much evidence that teachers' qualification cause better performance in MENA. School resources availability is found to have statistically significant effect on performance in MENA countries form meta-analysis, though this effect is driven by the significant effect from Turkey and Iran. Other factors such as community type and disadvantaged students influence student's performance across MENA countries but with only limited significance.

This chapter covered more detailed analysis on the heterogeneity of the determinants of educational production through quantile regressions. There are two main findings that might be of policy interest; the school resources effects and computer usage. The school resources effect is only present at the lower and median quantiles in Iran and Turkey, which could be interpreted as targeting the low and medium resources school and increasing the availability of resources would achieve improvement for low performing students. The quantile analysis confirms the insignificant effect of school resources in other MENA countries which might be investigated more from the curriculum point of view. The computer usage works in the same way as school resources; however it significantly reduces the attainment of students in all countries except Iran and Turkey.

Appendix C-3: Quantile Estimates

Table A-4.1: Quantile Regression Estimates for Saudi Arabia

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	-7.404	(10.191)	0.453	(10.141)	4.166	(7.503)
Upper-sec	-2.942	(9.752)	0.352	(10.433)	-0.771	(10.133)
Post-sec not UNI	10.209	(19.881)	16.058	(13.031)	19.049	(14.038)
University degree	14.449	(10.622)	18.239**	(9.095)	21.532***	(8.081)
Native parents	-9.114	(8.061)	-12.811	(8.482)	-12.602	(10.287)
One bookcases	11.592	(9.259)	14.065	(9.122)	14.706*	(8.497)
Two bookcases	5.508	(8.118)	11.588	(11.559)	12.137	(8.821)
Home possess H	54.145***	(14.627)	52.676***	(9.789)	50.316***	(9.450)
Home possess M	27.121*	(14.023)	26.915***	(9.927)	23.808**	(9.943)
Boy Student	-20.122	(36.454)	-13.768	(33.334)	-11.559	(46.043)
TL spoken ALs	-4.461	(6.945)	-3.005	(6.209)	-6.673	(6.021)
PC at H&SCL	-17.374*	(10.290)	-16.750	(10.710)	-14.816	(9.396)
PC at H/SCL	-15.787**	(6.895)	-15.238*	(7.987)	-13.168	(8.184)
Male teacher	2.131	(36.994)	-1.352	(34.295)	-2.276	(43.288)
T. Experience	0.021	(0.556)	0.216	(0.617)	0.373	(0.447)
M SCL RCS	-11.898	(15.268)	-10.095	(12.024)	-14.391	(11.554)
L SCL RSC	-22.108	(17.420)	-18.444	(13.168)	-17.936	(17.615)
T. UNI Degree/pg	-16.663	(14.220)	-10.626	(19.775)	-12.792	(16.874)
COMMU.>50000	13.536**	(6.041)	14.620*	(8.365)	14.817**	(6.207)
Pov 50% Disadv	-4.972	(8.975)	-3.910	(9.881)	-3.051	(6.863)
Class size	-0.256	(0.804)	-0.759	(0.803)	-0.655	(0.934)
Class size Sq	0.003	(0.009)	0.007	(0.008)	0.005	(0.009)
Constant	302.998***	(25.198)	345.808***	(28.368)	396.445***	(23.452)

- No teaching certificate variable available for Saudi Arabia. All teacher PG merged with university degree for QR.

Table A-4.2: Quantile Regression Estimates for Algeria

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	-3.749	(7.381)	-6.400	(4.304)	-8.885	(5.492)
Upper-sec	3.485	(6.060)	1.947	(5.530)	1.671	(6.147)
Post-sec not UNI	4.773	(7.286)	4.387	(4.647)	5.281	(9.102)
University degree	0.191	(7.383)	-1.230	(5.046)	-1.042	(7.977)
Native parents	-	-	-	-	-	-
One bookcases	9.586	(6.586)	11.583**	(4.675)	14.772**	(7.119)
Two bookcases	2.923	(11.903)	4.596	(7.589)	9.837	(7.406)
Home possess H	17.321**	(6.913)	16.885***	(5.347)	15.656*	(8.656)
Home possess M	12.369*	(6.796)	14.538***	(5.135)	16.173*	(8.328)
Boy Student	6.577*	(3.955)	7.425**	(3.326)	7.449	(4.560)
TL spoken ALs	0.976	(4.217)	1.209	(2.843)	1.123	(4.066)
PC at H&SCL	-15.281	(10.137)	-14.252*	(7.826)	-14.069	(11.949)
PC at H/SCL	-5.602	(5.595)	-2.266	(4.390)	-1.188	(4.891)
Male teacher	3.692	(6.566)	3.754	(5.327)	5.929	(4.542)
T. Experience	-0.261	(0.362)	-0.245	(0.388)	-0.294	(0.398)
T. Certificate	2.544	(7.993)	2.661	(5.459)	4.109	(5.337)
M SCL RCS	-0.110	(11.644)	-3.443	(5.365)	-3.755	(12.196)
L SCL RSC	3.590	(16.950)	0.308	(9.920)	0.378	(12.289)
T. UNI Degree/pg	-5.786	(12.135)	-4.064	(7.234)	-0.389	(10.990)
COMMU.>50000	-1.445	(6.706)	0.376	(4.564)	3.010	(4.892)
Pov 50% Disadv	0.546	(7.251)	1.017	(4.486)	0.231	(4.580)
Class size	1.617	(1.614)	1.452	(0.921)	2.200*	(1.258)
Class size Sq	-0.015	(0.027)	-0.014	(0.016)	-0.026	(0.021)
Constant	298.147***	(30.349)	341.087***	(14.238)	367.868***	(26.688)

- All native Algerian
- All teacher PG merged with university degree for QR.

Table A-4.3: Quantile Regression Estimates for Egypt

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	8.931	(10.951)	8.878	(12.032)	7.759	(10.842)
Upper-sec	25.544**	(10.171)	25.300*	(13.542)	24.096*	(14.636)
Post-sec not UNI	33.534***	(10.027)	35.434**	(14.976)	34.687***	(12.613)
University degree	2.967	(9.799)	2.085	(13.077)	0.641	(13.400)
Native parents	45.989***	(9.423)	52.355***	(11.440)	51.328***	(9.211)
One bookcases	11.487	(8.731)	11.843	(9.084)	12.169*	(7.249)
Two bookcases	-0.423	(10.389)	3.482	(13.610)	6.788	(8.530)
Home possess H	60.950***	(9.901)	59.683***	(11.617)	57.952***	(10.005)
Home possess M	38.920***	(10.570)	42.815***	(10.168)	42.844***	(8.605)
Boy Student	-11.589	(8.082)	-9.281	(8.440)	-9.140	(7.861)
TL spoken ALs	-19.376***	(6.944)	-20.933**	(8.180)	-21.524***	(6.558)
PC at H&SCL	-35.163***	(8.945)	-26.648**	(10.544)	-22.885*	(13.459)
PC at H/SCL	-25.986***	(6.692)	-23.612***	(7.549)	-24.750**	(12.112)
Male teacher	-1.468	(9.925)	1.723	(11.849)	5.781	(8.685)
T. Experience	1.250**	(0.627)	1.109	(0.756)	0.880**	(0.402)
T. Certificate	13.436	(9.907)	6.762	(13.134)	4.158	(10.316)
M SCL RCS	-5.995	(10.090)	-5.935	(11.293)	-4.602	(7.709)
L SCL RSC	-15.226	(23.502)	-20.408	(19.291)	-23.853	(20.405)
T. UNI Degree/pg	-10.262	(34.588)	1.009	(22.969)	-1.168	(23.011)
COMMU.>50000	13.942	(9.484)	9.604	(11.506)	7.068	(6.876)
Pov 50% Disadv	-10.443	(10.676)	-8.960	(12.679)	-8.560	(8.359)
Class size	-1.004	(2.772)	-0.892	(3.836)	-0.158	(2.938)
Class size Sq	0.007	(0.040)	0.007	(0.050)	-0.005	(0.040)
Constant	307.041***	(58.421)	347.608***	(74.460)	403.368***	(59.858)

- All teacher PG merged with university degree for QR

Table A-4.4: Quantile Regression Estimates for Syria

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	0.534	(12.692)	1.043	(11.769)	-1.553	(11.348)
Upper-sec	-2.365	(13.258)	-7.275	(11.828)	-9.211	(8.144)
Post-sec not UNI	15.404	(13.006)	18.147	(14.579)	18.103*	(10.497)
University degree	21.917	(13.447)	20.686	(13.242)	23.127**	(11.676)
Native parents	21.251**	(9.548)	20.183**	(8.589)	19.766	(13.404)
One bookcases	6.497	(6.259)	7.354	(7.359)	6.423	(7.911)
Two bookcases	-1.501	(7.082)	1.787	(9.924)	8.537	(13.094)
Home possess H	39.268***	(12.173)	44.052***	(9.143)	41.066***	(13.219)
Home possess M	28.146***	(10.295)	29.942**	(12.184)	29.724**	(12.190)
Boy Student	17.091	(10.882)	20.590***	(7.175)	20.574**	(8.730)
TL spoken ALs	3.270	(8.940)	2.268	(6.457)	3.312	(9.206)
PC at H&SCL	-9.210	(9.223)	-15.594**	(7.201)	-14.883**	(7.529)
PC at H/SCL	-12.232	(8.762)	-15.023**	(7.546)	-11.887	(8.598)
Male teacher	-1.446	(10.480)	2.696	(8.004)	3.206	(10.695)
T. Experience	0.511	(0.614)	0.445	(0.537)	0.271	(0.679)
T. Certificate	-14.116	(11.262)	-9.847	(10.857)	-4.055	(13.848)
M SCL RCS	7.616	(23.437)	6.438	(13.897)	16.022	(16.544)
L SCL RSC	16.449	(37.976)	13.514	(21.130)	16.145	(25.098)
T. UNI Degree/pg	12.570	(10.856)	11.047	(8.347)	8.308	(10.742)
COMMU.>50000	3.666	(9.176)	-3.917	(10.684)	-14.516	(10.704)
Pov. 50% Disadv.	-19.633**	(9.768)	-21.613**	(9.768)	-29.148***	(10.114)
Class size	-1.953	(3.068)	-2.551	(2.459)	-3.068	(4.565)
Class size Sq	0.019	(0.055)	0.027	(0.042)	0.039	(0.079)
Constant	335.835***	(51.963)	401.073***	(47.209)	453.854***	(75.069)

- All teacher PG merged with university degree for QR

Table A-4.5: Quantile Regression Estimates for Iran

Iran	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	-0.542	(5.808)	5.178	(5.642)	6.260	(7.392)
Upper-sec	8.346	(8.043)	16.169**	(7.799)	19.095*	(9.845)
Post-sec not UNI	10.095	(11.856)	17.748*	(10.588)	25.299**	(11.405)
University degree	28.169*	(15.938)	37.863***	(12.318)	46.421***	(12.996)
Native parents	25.494***	(8.755)	17.944	(13.780)	19.161	(15.640)
One bookcases	21.518***	(7.413)	22.684***	(5.122)	21.629***	(8.282)
Two bookcases	10.123	(9.765)	15.428**	(6.663)	9.362	(10.749)
Home possess H	17.968*	(10.152)	12.969	(11.162)	12.279	(13.708)
Home possess M	14.677**	(5.999)	9.642	(6.510)	9.905	(7.885)
Boy Student	4.549	(14.112)	5.347	(10.612)	9.981	(16.655)
TL spoken ALs	15.698**	(6.229)	15.398***	(5.550)	9.896	(7.286)
PC at H&SCL	54.151**	(24.610)	74.711***	(22.409)	90.767**	(38.980)
PC at H/SCL	10.557	(10.109)	13.968	(10.275)	19.242**	(8.580)
Male teacher	-8.330	(14.373)	-5.092	(10.175)	-7.862	(15.641)
T. Experience	0.362	(0.554)	0.150	(0.372)	-0.141	(0.459)
M SCL RCS	-20.332*	(10.772)	-16.578**	(7.928)	-16.676	(15.522)
L SCL RSC	-29.151**	(13.369)	-26.655***	(9.651)	-25.673	(17.733)
T. UNI Degree/pg	2.576	(5.954)	3.085	(5.073)	2.567	(6.876)
COMMU.>50000	15.148*	(8.383)	16.237**	(6.535)	19.734**	(8.750)
Pov 50% Disadv	-11.796*	(6.128)	-11.011	(7.895)	-10.727	(7.661)
Class size	-0.321	(2.234)	-0.333	(2.331)	-0.324	(1.790)
Class size Sq	0.020	(0.045)	0.012	(0.043)	0.009	(0.039)
Constant	307.385***	(27.777)	362.100***	(30.322)	411.786***	(34.821)

- No teaching certificate variable available for Iran. All teacher PG merged with university degree for QR

Table A-4.6: Quantile Regression Estimates for Tunisia

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	-8.770	(7.736)	-7.827	(5.553)	-14.683**	(6.562)
Upper-sec	-6.828	(6.681)	-5.901	(6.260)	-11.720	(7.725)
Post-sec not UNI	2.507	(10.924)	3.881	(9.531)	-1.083	(7.787)
University degree	7.903	(9.979)	11.284*	(5.947)	10.093	(7.859)
Native parents	25.374***	(8.830)	21.701**	(10.655)	20.963***	(7.961)
One bookcases	13.620**	(6.016)	17.023***	(5.162)	22.755***	(4.621)
Two bookcases	28.728***	(8.272)	37.604***	(7.538)	40.659***	(8.708)
Home possess H	29.803***	(8.205)	36.436***	(7.952)	41.655***	(10.393)
Home possess M	11.814	(8.205)	16.647***	(6.020)	20.447***	(7.655)
Boy Student	23.946***	(4.714)	23.671***	(4.367)	22.341***	(3.710)
TL spoken ALs	-13.951	(9.049)	-13.263**	(5.913)	-14.065**	(5.563)
PC at H&SCL	-29.903***	(10.389)	-33.398**	(13.493)	-37.309*	(19.423)
PC at H/SCL	-9.075	(5.887)	-11.666*	(6.172)	-12.456**	(5.094)
Male teacher	-5.055	(4.578)	-3.739	(5.618)	-5.344	(4.628)
T. Experience	0.491	(0.408)	0.461	(0.399)	0.329	(0.349)
T. Certificate	2.985	(9.218)	1.114	(9.739)	-0.629	(7.048)
M SCL RCS	-1.265	(6.400)	-0.891	(12.976)	-0.338	(9.470)
L SCL RSC	-5.744	(10.296)	-1.540	(13.205)	-0.594	(9.573)
T. UNI Degree/pg	-3.442	(10.322)	-0.860	(13.503)	-6.896	(10.121)
COMMU.>50000	0.510	(6.005)	-0.883	(5.572)	0.148	(5.105)
Pov 50% Disadv	-10.261	(6.523)	-8.209	(6.922)	-5.009	(5.272)
Class size	-4.810	(3.228)	-4.465***	(1.621)	-3.933*	(2.143)
Class size Sq	0.114*	(0.059)	0.107***	(0.037)	0.095***	(0.037)
Constant	377.375***	(54.233)	407.388***	(32.604)	451.905***	(41.376)

- All teacher PG merged with university degree for QR

Table A-4.7: Quantile Regression Estimates for Jordan

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	-7.205	(19.891)	-4.306	(19.318)	2.910	(23.469)
Upper-sec	11.935	(11.697)	11.022	(12.969)	12.019	(16.548)
Post-sec not UNI	43.125**	(17.587)	46.593***	(13.519)	41.512**	(20.075)
University degree	33.046**	(14.499)	35.323**	(14.401)	39.924**	(18.909)
Native parents	-0.793	(7.531)	-4.472	(9.004)	-11.255*	(6.366)
One bookcases	15.397	(10.937)	17.190	(10.626)	17.792***	(6.195)
Two bookcases	22.888	(14.482)	23.689**	(9.861)	21.017***	(7.681)
Home possess H	59.939***	(14.845)	65.609***	(15.913)	61.080***	(17.402)
Home possess M	48.655***	(13.824)	52.980***	(13.358)	56.609***	(17.596)
Boy Student	-16.285	(31.077)	-15.221	(36.095)	-14.538	(17.680)
TL spoken ALs	-11.790	(10.173)	-9.784	(8.132)	-11.720	(7.903)
PC at H&SCL	-0.383	(15.860)	-1.688	(11.288)	-3.600	(19.635)
PC at H/SCL	-29.034**	(14.409)	-23.160**	(11.000)	-20.036	(18.757)
Male teacher	-7.074	(32.837)	-1.470	(36.794)	5.204	(19.093)
T. Experience	0.465	(0.820)	0.597	(0.868)	0.652	(0.676)
T. Certificate	-2.089	(12.059)	-1.103	(10.716)	6.020	(12.183)
M SCL RCS	-10.906	(20.610)	-8.795	(11.095)	-9.263	(11.311)
L SCL RSC	-4.990	(29.674)	-0.432	(19.928)	-3.297	(13.521)
T. UNI Degree	15.224	(29.096)	13.648	(22.369)	3.904	(14.963)
COMMU.>50000	16.593	(14.179)	21.256**	(9.468)	25.813**	(10.375)
Pov 50% Disadv	-19.561	(13.383)	-19.357*	(11.270)	-9.456	(11.017)
Class size	-0.710	(4.245)	-1.371	(2.370)	-0.840	(2.862)
Class size Sq	-0.006	(0.054)	-0.002	(0.031)	-0.009	(0.037)
Constant	353.893***	(95.756)	422.251***	(50.514)	472.493***	(60.542)

- All teacher PG merged with university degree for QR

Table A-4.8: Quantile Regression Estimates for Turkey

DV: Maths test score	.25	s.e	.50	s.e	.75	s.e
Lower-sec EDC	3.837	(12.674)	8.749	(7.934)	13.433	(11.676)
Upper-sec	26.639*	(14.061)	34.699***	(10.617)	37.741**	(15.185)
Post-sec not UNI	38.910*	(21.543)	51.630**	(25.729)	60.593***	(18.763)
University degree	86.225***	(19.898)	104.110***	(13.679)	104.445***	(15.142)
Native parents	31.970***	(12.216)	43.365***	(14.606)	45.630**	(21.469)
One bookcases	27.837***	(7.465)	25.632***	(7.808)	25.174**	(11.711)
Two bookcases	22.506**	(9.905)	29.453***	(10.659)	31.612***	(10.598)
Home possess H	34.148***	(12.581)	34.843**	(14.143)	21.537	(28.577)
Home possess M	21.483*	(10.995)	24.953**	(10.915)	14.802	(24.770)
Boy Student	6.991	(6.270)	7.603	(6.434)	10.141*	(6.002)
TL spoken ALs	28.518***	(6.942)	30.022***	(8.178)	32.731***	(7.809)
PC at H&SCL	25.929**	(11.145)	29.470**	(11.869)	35.641***	(11.571)
PC at H/SCL	10.024	(10.995)	11.123	(10.146)	13.711	(12.319)
Male teacher	12.182	(9.737)	13.453	(9.982)	6.783	(12.640)
T. Experience	0.668	(1.232)	0.798	(1.114)	0.694	(1.136)
M SCL RCS	-40.726***	(14.639)	-28.674**	(12.426)	-12.878	(14.724)
L SCL RSC	-52.426***	(15.456)	-34.109**	(13.705)	-18.508	(19.348)
T. UNI Degree	8.195	(27.882)	11.546	(20.750)	3.926	(22.950)
COMMU.>50000	12.866	(10.647)	11.465	(10.700)	20.607*	(11.372)
Pov 50% Disadv	-26.298**	(11.485)	-30.549***	(11.714)	-36.133***	(13.957)
Class size	0.254	(1.650)	0.637	(1.956)	0.272	(2.264)
Class size Sq	-0.008	(0.022)	-0.014	(0.024)	-0.008	(0.030)
Constant	287.667***	(53.572)	305.785***	(56.636)	365.433***	(68.029)

- All teacher PG merged with university degree for QR

Table A-4.9: Models power of explanation

Country	Average R-square	
	Full model	School Fixed Effects (SFE)
Saudi Arabia	.1849	.2881
Algeria	.0471	.1478
Egypt	.2458	.3913
Syria	.1534	.4180
Iran	.2798	.4428
Tunisia	.2370	.3086
Jordan	.2344	.4275
Turkey	.3204	.4552

Table A-4.10: School fixed effects estimates for MENA

DV: Maths test scores	KSA	se	ALG	se	EGY	se	SYR	se	IRN	se	TUN	se	JOR	se	TUR	se
Lower-sec EDC	-1.482	(4.846)	-7.115***	(2.708)	4.629	(5.449)	3.052	(4.394)	2.246	(4.361)	-13.422***	(4.265)	-9.264	(7.963)	6.911	(4.598)
Upper-sec	-2.030	(4.248)	1.954	(2.743)	16.267***	(6.229)	-4.307	(4.502)	10.281**	(4.702)	-10.788***	(4.187)	3.576	(5.903)	20.502***	(5.842)
Post-sec not UNI	11.723	(9.185)	2.327	(3.407)	23.815***	(6.655)	15.360***	(4.665)	7.091	(7.289)	-3.626	(4.637)	25.353***	(5.949)	21.997**	(9.160)
University degree	14.115**	(5.980)	-2.907	(3.376)	-6.219	(6.504)	16.881***	(5.272)	13.073*	(6.764)	2.631	(5.279)	23.174***	(6.471)	55.928***	(8.037)
Native parents	-10.651**	(4.353)	-	-	45.717***	(3.943)	16.153***	(4.328)	15.746	(9.924)	22.210***	(5.342)	0.000	(3.389)	32.631***	(8.773)
One bookcases	11.681**	(4.990)	11.976***	(2.703)	7.034*	(4.087)	6.080*	(3.113)	15.545***	(3.985)	16.315***	(3.282)	12.066***	(4.595)	18.843***	(3.328)
Two bookcases	5.758	(4.211)	7.023	(4.567)	3.921	(4.136)	3.043	(3.582)	7.170	(5.097)	32.905***	(4.498)	12.163**	(5.118)	23.343***	(5.432)
Home possess H	45.540***	(4.685)	15.949***	(3.965)	40.655***	(4.662)	26.749***	(4.250)	5.623	(6.853)	34.422***	(5.407)	50.797***	(5.978)	17.965**	(7.864)
Home possess M	23.169***	(4.461)	14.344***	(3.519)	32.608***	(4.076)	21.414***	(4.070)	7.260**	(3.680)	17.328***	(4.052)	44.705***	(5.288)	17.383***	(5.806)
Boy Student	27.266	(30.133)	7.134***	(1.734)	1.454	(4.987)	13.700***	(4.341)	24.049**	(11.612)	22.413***	(2.098)	12.721	(10.851)	9.778***	(3.266)
TL spoken AL	-3.148	(3.837)	0.885	(2.060)	-13.976***	(3.734)	-2.309	(3.762)	3.858	(4.343)	-16.986***	(4.331)	-11.479***	(4.410)	28.152***	(4.249)
PC H&SCL	-13.347**	(6.218)	-15.585***	(4.208)	-24.004***	(4.501)	-10.650**	(4.165)	24.215*	(14.482)	-30.723***	(6.543)	-0.766	(6.034)	28.695***	(6.008)
PC H or SCL	-10.362***	(3.917)	-4.033	(2.891)	-19.627***	(3.900)	-8.724**	(3.984)	4.205	(6.405)	-12.418***	(2.662)	-18.735***	(5.908)	12.394***	(4.493)
Male T.											6.264	(14.423)				
T. Experience	0.269	(3.887)									0.964	(1.172)				
T. Certificate											23.822	(21.835)				
M SCL RCS																
L SCL RSC																
T. UNI Degree	-21.716	(25.260)									-45.715	(59.089)				
COMMU.>50 000																
Pov 50% DisAdv																
Class size	-5.012	(31.913)									-7.816	(126.986)				
Class size sq	0.014	(0.455)									0.162	(1.906)				
Constant	454.167	(513.391)	373.854***	(4.638)	332.432***	(19.240)	362.011***	(8.117)	363.076***	(12.633)	473.290	(2,157.811)	382.081***	(12.942)	326.413***	(11.729)

Note: Tunisia sampled two classrooms per school having at least 375 students and Saudi Arabia sampled two classrooms per school having at least 140 students

(Jackknife standard errors), $p<0.01$, $p<0.05$, $p<0.1$ & dummy controls for missing values include

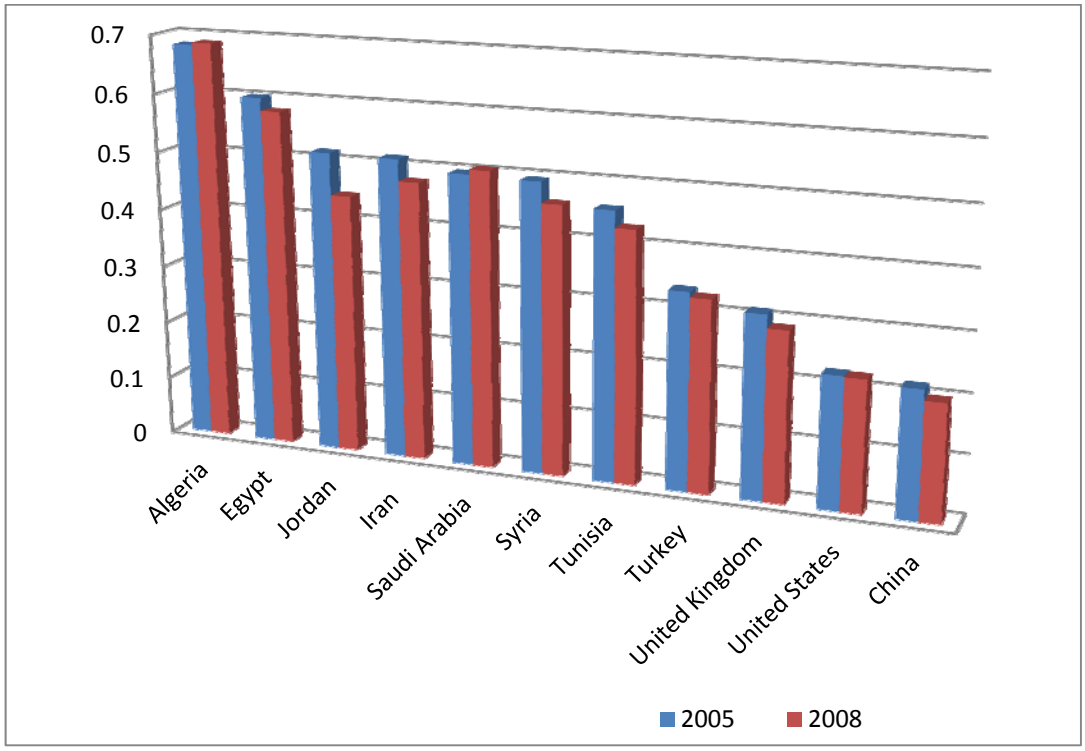
Chapter 5

GENDER DIFFERENTIALS IN MATHS TEST SCORES IN MENA

5.1 Introduction

Women tend to be disadvantaged in terms of job opportunities and wages. This gap is at least partially due to a significant gender gap in educational levels which remain large in many countries (World Development Report 2012). The Gender Inequality Index (GII) reflects women's disadvantage in three dimensions—reproductive health, empowerment and the labour market. The index shows the loss in human development due to inequality between female and male achievements in these dimensions. It ranges from 0, which indicates that women and men fare equally, to 1, which indicates that women fare as poorly as possible in all measured dimensions.

Figure 5-1: Gender Inequality Index (GII), 1995 and 2008



Source: HDRO calculations based on UNICEF (2011), UNDESA (2011), IPU (2011), Barro and Lee (2010), UNESCO (2011) and ILO (2011).

The health dimension is measured by two indicators: maternal mortality ratio and the adolescent fertility rate. The empowerment dimension is also measured by two indicators: the share of parliamentary seats held by each sex and by secondary and higher education attainment levels. The labour dimension is measured by women's participation in the work force (Klugman 2011).The GII reflects high inequality in MENA countries also countries vary with inequality level. Algeria has the largest gap and turkey is the least as shown in Figure 5-1.

The gender gap is potentially due to difference in the types of human capital women and men have from the same level of education. For example, there is considerable evidence of a strong correlation between math test scores, math based curriculum, mathematical majors in college and future income earned. Those findings suggest that observed differences in math skills between boys and girls at school can explain part of the wage gap (Bharadwaj et al. 2012). Hence it is important to tackle the differences of maths skills and the role played by numerous factors starting from early childhood, such as parental education, family background, parents' expectations, schooling and teachers' characteristics. It is important for the process of human capital building to know when and how differences between men and women begin to develop to understand and to explain the gender gap in wages and job opportunities.

The previous chapter estimated education production functions for a sample of eight MENA countries using TIMSS to identify the determinants of educational achievement (measured as test scores in Maths), and demonstrated considerable variation across the countries. This chapter investigates the gender differentials in maths achievements in the MENA countries, i.e. the performance of girls compared to boys. We investigate the factors that may explain the differentials within countries and the differences across countries. As for the previous chapter, two broad types of factors are distinguished: student characteristics including home environment and school resources.

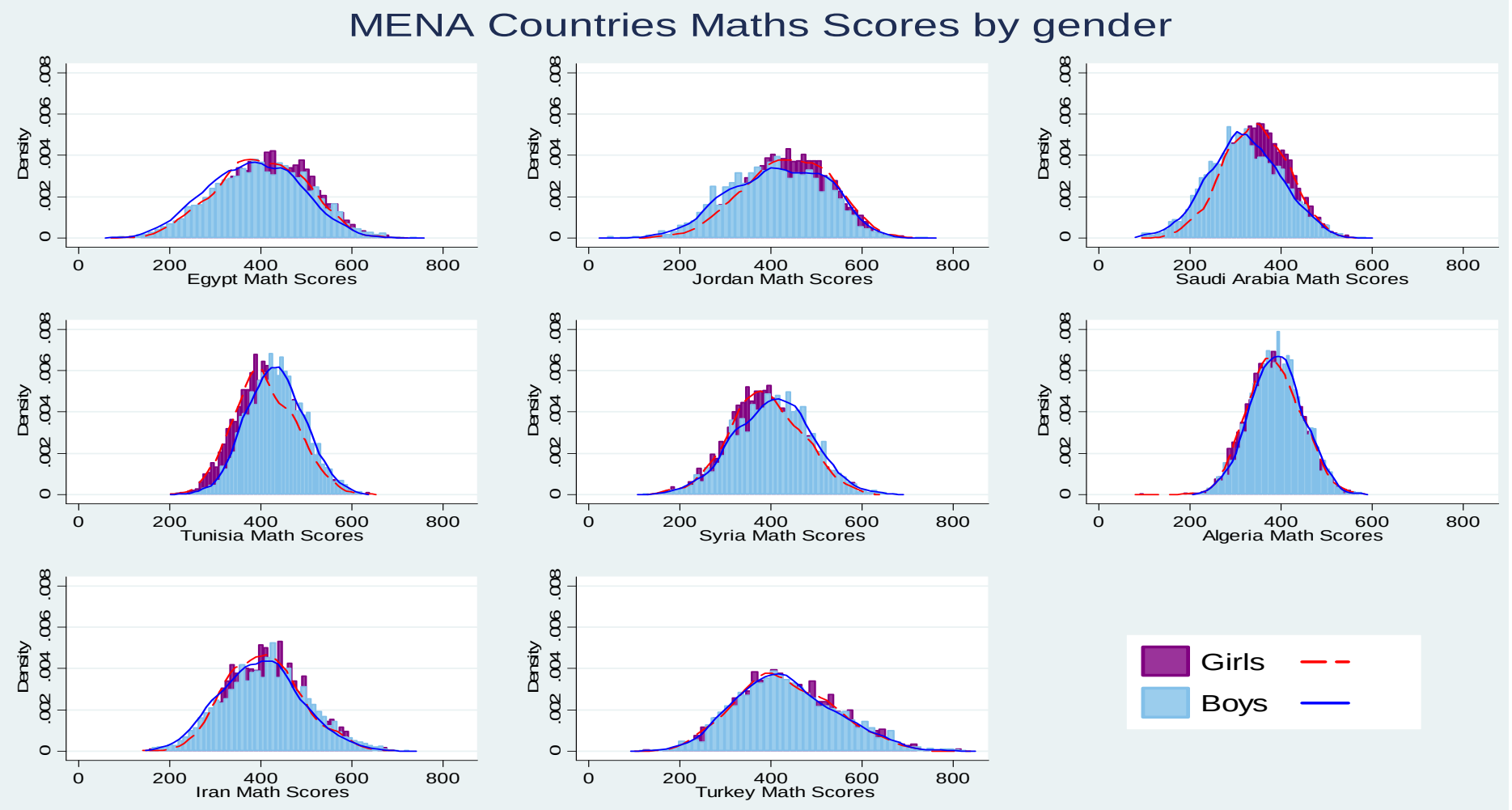
Economic and political inclusion of females is a fundamental development challenge for the MENA region, as gender inequality is quite widespread (World

Bank 2010). Women in MENA face limited labour market mobility, a mismatch of skills from school with labour market requirement (although this is a problem for all students), and legal, institutional or cultural restrictions. As shown in Chapter 2, there has been progress in enrolment ratios for girls so that the enrolment gender gap has largely disappeared for primary education (World Bank 2010). Enrolment differences in secondary education are evident in the few countries for which data are available but are not consistent, with the rate for girls higher than boys in Saudi Arabia but lower in Syria and Turkey. However, it is the quality of education that is most important for labour productivity, and gender differences in achievement will have labour market ramifications. Appleton (1995) argues that poor performance for girls is related to gender inequality of time within poor families, hence educational outcome is related to the home background. The principal aim of this chapter is to assess the extent of gender differences in test scores for the MENA countries.

Perhaps surprisingly, there is no common pattern of gender differences in maths test scores across countries, although the differences across countries are marked. As shown in Figure 5-2, in two countries there is no difference (Iran and Turkey, bottom row), in three girls perform better (Egypt, Jordan and Saudi Arabia, top row) and in three boys perform better (Algeria, Syria and Tunisia, middle row). The median scores are close to 400 for all countries but the distributions are quite different – notably narrow and peaked for Algeria and Tunisia, flatter for Egypt, Jordan and especially Turkey. This implies that it is important to investigate gender differences across the distribution of scores.

This chapter adds to the literature in two ways. First, to our knowledge, there is no other study using test scores (to capture cognitive skills and education quality) to characterize and investigate the determinants of the education gender gap in a sample of MENA countries. Second, we employ mean and quantile decomposition analysis to identify any covariates contributing to the gender difference at points in the distribution, facilitating a richer exploration of the data.

Figure 5-2: Test scores distribution by gender across MENA countries



Decomposition analysis offers a means to analyse the differences in outcomes between groups, males and females in our case. The original literature on decomposition and many subsequent studies addressed wage inequality especially by gender (Blinder 1973; Oaxaca 1973). Fortin, Firpo, and Lemieux (2010) provide the theoretical framework and a comprehensive discussion of decomposition techniques. The methods are relatively simple when applied to the mean estimates using standard Oaxaca-Blinder decomposition, but the mean is not a good representation of the whole distribution. Inequality at the top and bottom of the distribution may be particularly interesting and techniques have been developed for decomposition analysis across the entire distribution. The main challenge is to construct a counterfactual distribution with acceptable assumptions and consistent estimates. These methods are reviewed in Section 4.3.

The structure of the chapter is as follows. Section 5.1 provides a brief overview of related literature, section 5.2 present backgrounds on gender inequality in education in MENA (more detail can be found in Chapter 2) and discusses the TIMSS data for MENA. Section 5.3 outlines the decomposition methods employed in the chapter, and Section 5.4 provides and discusses the decomposition results (detailed results are in the Appendix). Section 5.5 concludes with a consideration of implications for education policy to reduce inequality.

5.2 Gender Inequality in Education: Context and MENA

5.2.1 **Test Score Performance in MENA Countries**

As discussed in Chapter 3, test score performance in MENA countries is low by international, and even developing country (given incomes), standards. Although the low levels of performance apply to boys and girls, the differences vary across the MENA countries. Table 5.1 shows the mean scores and percentage of boys and girls with test scores at or below various TIMSS international benchmarks for the MENA countries. About half or more of students fall below the lowest benchmark (400 represents basic knowledge) in all countries except Jordan, Tunisia and Turkey (the only countries where mean scores for boys and girls are above 400, Iran being at 400 for girls and slightly above for boys). About 80% of Saudi students do not meet

the lowest benchmark requirement in mathematics, with only three percent above the 475 point benchmark. Few MENA countries have significant shares of students achieving more than 550 points, except Turkey (15% of boys and girls), Jordan (12% of girls and 10% of boys) and to a lesser extent Iran and Egypt (6% girls and 5% boys).

In addition to the generally low performance across countries, a striking feature is that there is no relationship between the gender bias and overall performance. The three countries with the highest mean scores include one with a bias in favour of girls (Jordan), one in favour of boys (Tunisia) and one with no bias (Turkey); Iran, with no bias, is the next best in performance.

Table 5.1 : Students (%) by international benchmarks of maths test scores

Country	sex	Mean	Benchmarks				
			Below 400	From 400 to 475	From 475 to 550	From 550 to 625	At or Above 625
Egypt	**Girls**	399	50	27	17	5	1
	Boys	384	56	25	15	4	1
Jordan	**Girls**	438	35	28	25	10	2
	Boys	418	42	25	22	9	1
Saudi	**Girls**	343	79	18	3	0	0
	Boys	320	84	13	2	0	0
Iran	**Girls**	407	47	32	15	5	1
	Boys	400	51	30	14	4	1
Turkey	**Girls**	431	40	27	18	10	5
	Boys	432	41	26	18	10	5
Tunisia	**Girls**	410	45	37	16	2	0
	Boys	432	32	43	21	4	0
Syria	**Girls**	389	57	29	12	2	0
	Boys	404	47	33	17	3	0
Algeria	**Girls**	385	61	32	6	0	0
	Boys	390	57	35	7	0	0

Note: Relates to students in school grade 8 (about 14 years old)

Source: Own calculations from TIMSS 2007

The worst performer has a gender bias towards girls (Saudi) whereas the next worst has a bias towards boys (Algeria). Of the remaining two, Egypt has a bias towards girls, and Syria towards boys. This implies that, at least in terms of means, factors that explain performance may not be the same as factors that explain gender differences.

Appendix Table A-5.1 provides descriptive statistics of maths test scores for each country with the mean, standard deviation, coefficient of variation, skewness and central peak and shape measured by kurtosis. The coefficient of variation (CV)

captures the 'spread' of the distribution. This is least for Algeria and Tunisia with compressed distributions around the mean, and largest for Turkey. The skewness statistic captures the asymmetry of the distribution of scores around the mean; if the distribution is skewed to the right it is positive (above the mean), to the left it is negative (mildly so for Jordan), or if equal to zero it is symmetrical around the mean (normal distribution). Test scores tend to be symmetric and close to a normal distribution; in no country does skewness exceed boundaries of (+0.5 to -0.5). There is positive skewness but not very pronounced for Turkey (especially boys) and even less so for Iran (especially girls), so both have a relatively larger number of strong performers (as suggested in Table 5.1).

The kurtosis statistic indicates the weight in the tails of the distribution; if it is positive there is a greater likelihood of higher extreme values from the mean (greater weight to the right), if it is negative there is greater weight below the mean. Kurtosis is positive in all countries, but close to the bound for a normal distribution (3), as would be expected given the low mean and median values. The percentiles threshold tests scores show substantial differences across distributions among MENA by gender, illustrated in Figure 5-2and Figure 5-3.

Figure 5-2 exploits the differences between boys and girls. The first row comprises the three countries (Egypt, Jordan and Saudi Arabia) where girls outperform boys, illustrated by the dark shading to the right of the mean. The middle row shows the countries (Tunisia, Syria and Algeria) where boys outperform girls, so the dark shading is to the left of the mean. Although there are no significant differences in mean scores in Iran and Turkey (final row), the dark shading shows differences between boys and girls in parts of the distribution.

Figure 5-3: Test scores gap between boys and girls in MENA across quantiles

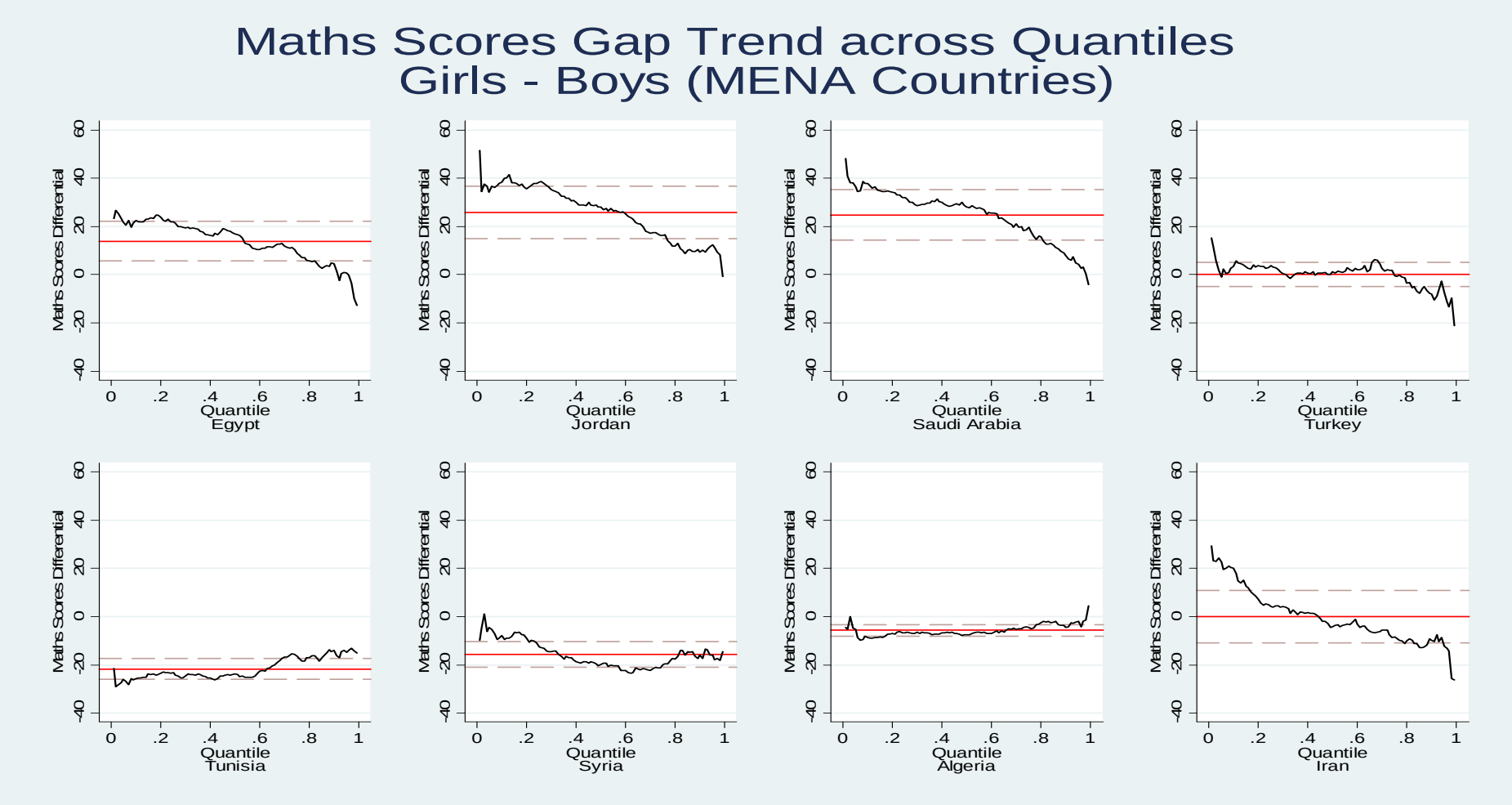
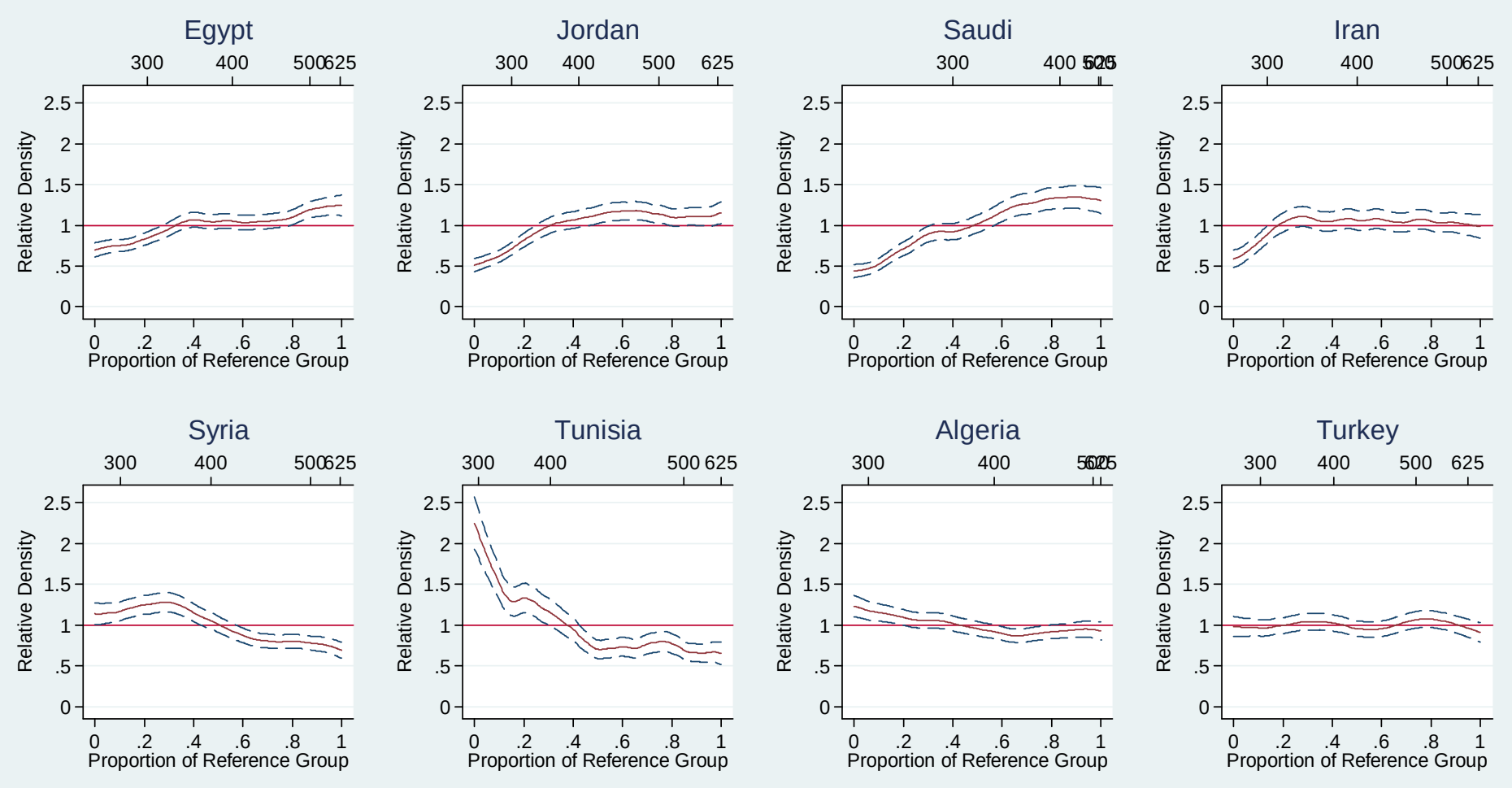


Figure 5-4: Relative distribution of maths test scores in MENA countries by gender (boys as reference)



The quantiles distribution of test scores differences (girls – boys) in Figure 5-3 illustrate the gap across the distribution. The horizontal solid line represents the mean gap (the dotted lines show the standard deviation); for example, the mean test scores gap is 13 points in favour of girls in Egypt. The gap is not symmetric across distributions. In the three countries where girls do better than boys at the mean the distribution tends to be downward sloping, i.e. girls do considerably better at lower levels of performance, but among those with higher test scores there is no difference, and in Egypt boys do better. Although there is no mean difference in Iran or Turkey, the distribution is downward sloping: girls do considerably better at lower levels of performance but boys do better at higher levels (especially in Iran). Thus, the mean disguises considerable differences at the tails, especially in Iran. The distribution is much flatter in the countries where boys do better, slightly upward sloping for Algeria and Tunisia, and somewhat U shaped for Syria, but always negative (except the top performers in Algeria, where girls do slightly better).

The distribution of the gender gap differences is illustrated in a more comparable way with the relative distributions in Figure 5-4. Relative distribution is a non-parametric method to analyze differences between groups graphically (Handcock and Morris 1998). The method compares the relative ranks of two groups using one as the reference (boys in Figure 5-4). Taking Syria as an example, a relatively high percentage of girls are at the bottom quantiles, so girls comprise a larger share of worst performers compared to boys, whereas a relatively greater share of boys are in the top quantiles. This is even more pronounced in Tunisia and less pronounced in Algeria, the two other countries where boys do better on average. In the three countries where girls do better on average, girls are 'over-represented' in the top quantiles. The relative distribution is very flat in Turkey and quite flat in Iran.

5.3 Methods

The best known decomposition technique in economics is the Oaxaca-Blinder decomposition method originally used in labour economics to decompose earnings gaps between groups, such as gender, to study wage discrimination (Oaxaca, 1973; Blinder, 1973). The exposition here draws heavily on Fortin, Lemieux, and Firpo

(FFL), especially for the quantile decompositions and empirical implementations (Fortin et al. 2011).

5.3.1 **The Oaxaca-Blinder Decomposition Framework**

The main objective of the Oaxaca-Blinder method is to identify the sources of changes in the distribution of outcomes between different states of the world. The Oaxaca-Blinder decomposition splits the overall differences into two components, the first attributable to differences in pay-off structure and the second attributable to observable characteristics differences. An education production function of the following form is estimated for both groups:

$$T_{Kis} = \beta_0 + \delta_1 F_{Kis} + \delta_2 S_{Ks} + \alpha D_{Kis} + \varepsilon_{Kis}, \qquad K = g, b \qquad \textbf{(5.1)}$$

Where T is the test score of student i in class c in school s (the c subscript is omitted for convenience as most MENA countries select only one class from each school), F is a vector of family background variables and S is a vector of teacher and school characteristics variables. D is a vector of dummy variables for each variable in F and S to capture missing observations; a dummy takes the value 1 for observations with missing data and 0 otherwise (the variables themselves are set to zero if their values are missing). The coefficient vectors α, δ_1 and δ_2 are to be estimated. The error term ε has two components as we have a two-stage stratified sample, the imputation error on student's level and the sample error at the school level.

We are interested in comparing the test scores distributions under the two mutually exclusive states of the world, being a boy (b) or a girl (g)

$$T_K = m_K(\mathrm{X}, \varepsilon), \qquad K = g, b \qquad \textbf{(5.2)}$$

where ε represent the unobservable characteristics. This implies that the test scores distributions (T) can vary between the two groups of students due to: 1) differences in the returns to variables in the education production function, $\mathrm{m}_K(.)$; 2) differences in the distribution of observable characteristics (X), which include covariates for student, family, and school characteristics; and *3)* differences in the unobservable characteristics (ε).

The Oaxaca-Blinder decomposition and its derivatives rely on estimating a counterfactual distribution of the outcome of interest under certain conditions. For example, we might be interested to know the distribution of the test scores that girls *(g)* would have experienced under the conditions prevailing for boys *(b)*. Let ***K*** indicate student's gender group, $T_{g|K=b}$ and $T_{b|K=g}$ represent the counterfactual test scores for the boys and girls respectively. Let $F_{T_b|K=b}$ stand for the distribution of the outcome T_b for boys. We can think of distributional statistics such as mean and quantiles as a real-valued functional of the relevant distributions. This allows us to express any distributional statistic of the test scores distribution as $\theta\left(F_{T_b|K=b}\right)$. Following FFL the overall differences in the distribution of achievements between boys and girls can be written as:

$$\Delta_O^{\theta} = \theta\left(F_{T_b|K_b}\right) - \theta\left(F_{T_g|K_g}\right) \qquad \textbf{(5.3)}$$

Splitting this overall difference into its components entails a comparison between the actual and the counterfactual scores distributions. Using the above counterfactuals we can write this decomposition as:

$$\Delta_O^{\theta} = \left[\theta\left(F_{T_b|K=b}\right) - \theta\left(F_{T_g|K=b}\right)\right] + \left[\theta\left(F_{T_g|K=b}\right) - \theta\left(F_{T_g|G=g}\right)\right] \qquad \textbf{(5.4)}$$

Simplifying the notation by replacing the distributional function by the sample averages, the decomposition is:

$$\Delta_O^{\theta} = \overline{X}_b\,\hat{\beta}_b - \overline{X}_g\,\hat{\beta}_b + \overline{X}_g\,\hat{\beta}_b - \overline{X}_g\,\hat{\beta}_g$$

$$\Delta_O^{\theta} = \left(\overline{X}_b - \overline{X}_g\right)\hat{\beta}_b + \overline{X}_g\left(\hat{\beta}_b - \hat{\beta}_g\right) \qquad \textbf{(5.5)}$$

This aggregate decomposition could be shown as two components as in equation (5.6); the first component (Δ_X^{θ}) is the characteristics or the *endowment effect*, known also as composition effect (X) as it reflects differences in the distributions of X's between the boys test score distribution in group *b* and girls distribution of group *g*; the second (Δ_R^{θ}) represents the *returns effect* (R) and is known also as the educational response effect (in labour economics decomposition known as structure effect*)* since it reflects the differences in *coefficients.*

$$\Delta_O^{\theta} = \Delta_X^{\theta} + \Delta_R^{\theta} \qquad (5.6)$$

This decomposition requires two assumptions to hold. First, there are no general equilibrium effects. Second, unobservable factors are conditionally independent of the groups of interest, given the observables. The underlying assumptions of the aggregate decomposition make it easy to split the contribution of each covariate by detailed decomposition.

Empirical implementation of OB decomposition of the mean differences presents a number of issues, such as the choice of omitted group (Oaxaca and Ransom 1998) and non-linearity of the conditional mean function (Barsky et al. 2002). As some variables may be significant for one gender but not the other there is no unique reference group so we perform the analysis with both male and female as reference.

To allow for the possibility of non-linearity we employ a hybrid of the reweighting technique suggested by DiNardo, Fortin and Lemieux DFL (1996) and the recentered influence function (RIF) developed by Firpo, Fortin, and Lemieux FFL (2010), a mixed methods approach that provides a better estimates than the linear alternative for overall decomposition in the presence of non-linearity.

5.3.2 **Mean decomposition**

Following the literature (Ammermueller 2007; Jann 2008; Lauer 2000) we employ both twofold and a threefold decomposition that differs slightly from the two parts Oaxaca-Blinder decomposition presented in equation (5.6). In two-fold decomposition, the boy's group coefficients correspond to the "non-discriminating" coefficients (returns to characteristics); assuming that there is a difference in boys and girls coefficients. This suggests that family and school pay more attention to boys' education outcome in accordance to their marginal product but discriminate against girls. On the other hand, it is also plausible that family and school concentrate on girls' education at their marginal product but favour boys. In that case, it would be appropriate to value the characteristics gap by the girl rather than the boy coefficients (Lauer 2000).

Neumark (1988) proposed to determine the "non-discriminating" coefficient vector of the pooled sample of the two groups. Alternatively, Cotton (1988) preferred a weighted average of the two group coefficients, where the weights are the respective proportions of boys and girls in the sample. The choice of the "non-discriminating" reference affects the results and remains somewhat arbitrary. The discrimination interpretation is superficial; first, part of the characteristics component may also be due to discrimination in characteristics, and second, part of the coefficient component may not be attributable to discrimination, for example unobservable factors influence individual's productivity. The three-fold decomposition is a more acceptable alternative in that case since it will not be interpreted in terms of discrimination. The total score gap between boys and girls grouped at the mean are expressed as:

$$\Delta T_O = \overline{T}_b - \overline{T}_g \qquad (5.7)$$

Where g and b subscripts denote girls and boys and bars denotes weighted averages. The total maths score gap can be decomposed into three effects, characteristics, returns (coefficients), and characteristics-return interaction based on the WLS estimates of the EPF. The standard two part decomposition identifies two effects (characteristics and returns). The three-fold decomposition includes the interaction:

$$\Delta T = \hat{\beta}_g(\overline{X}_b - \overline{X}_g) + (\hat{\beta}_b - \hat{\beta}_g)\overline{X}_g + (\hat{\beta}_b - \hat{\beta}_g)(\overline{X}_b - \overline{X}_g) \qquad (5.8)$$

where X comprises the explanatory variables chosen in the production function. The first right hand side of the decomposition equation represents the characteristics effect; it shows how much girls would have scored if they had the same characteristics as boys. The second term represents the returns effect, how girls would have performed if they had the same coefficients as boys. The final part is the interaction between characteristics and returns, the effect of having different characteristics and coefficients. This decomposition is formulated from the viewpoint of girls. That is, the differences are weighted by the coefficients of girls to determine the characteristics effect. The returns effect measures the expected change in the girls' mean outcome if they had the boys' coefficients.

5.3.3 **Quantile Decomposition**

The Oaxaca-Blinder decomposition only applies to the differences in the mean, but decomposing over the mean does not allow for the distribution over quantiles, which was shown above to vary. Ideally the decomposition of test scores should be over the entire distribution. Juhn, Murphy, and Peirce (JMP) (Juhn et al. 1993), DiNardo, Fortin, Lemieux (DFL) (DiNardo et al. 1996), and Machado and Mata (MM) (Machado and Mata 2005) have proposed methods to decompose over quantiles and other distributional measures. Each method has limitations: heteroskedasticity with JMP, the curse of dimensions with DFL, and MM is computationally intensive. A general limitation to these methods is that only the conditional quantile interpretation is valid in the quantile regressions.

Firpo, Fortin, and Lemieux (2009) proposed an alternative where the estimated coefficient can be seen as the change of the mean value of the covariates on the unconditional quantile. This method offers a consistent computable aggregate and detailed decomposition of quantiles and overcomes the limitations of conditional quantile interpretations. The FFL method provides a way to measure the single covariate contribution to the differences, close to the Chernozhukov, Fernandez-Val and Melly (2009) method of estimating proportions and inverting back to quantiles. Both provide detailed decomposition in the spirit of traditional OB decomposition of the mean (Fortin et al. 2011).

5.3.3.1 Recentered Influence Function RIF (unconditional quantiles)

Firpo, Fortin and Lemieux (2009) proposed a regression approach to estimate the impact of the mean value of explanatory variables on the unconditional quantile. This method differs from the conditional quantile regression (Koenker 2005; Koenker and Bassett 1978) as it is based on unconditional quantile regression methodology. This is a two stage method. The first stage is to estimate a regression of a transformation of the unconditional quantile of the cognitive achievements variable on the explanatory variables, the Recentered Influence Function (RIF). This permits the estimation of standard partial effects, the Unconditional Partial Effects

(UQPE). The second stage uses these estimates to generate Oaxaca-Blinder decomposition for quantiles of interest.

The Firpo, Fortin and Lemieux method replaces the dependant variable (***T***) with a transformation based on the proposed recentered influence function. The RIF for the quantile of interest q_τ is formally defined as

$$RIF(T;q_\tau) = q_\tau + IF(T;q_\tau) = q_\tau + \frac{\tau - I(T \le q_\tau)}{f_T(q_\tau)} \qquad (5.9)$$

Where $\mathbf{q_\tau}$ can be estimated by the sample quantile, **I(.)** is an indicator function for whether the outcome variable is smaller or equal to the quantile, and f_T is the marginal density function of **T** can be estimated using Kernel density. FFL explains the recentered influence function in light of linear transformation of the associated function. RIF is equal to the population τ -quantile of the unconditional distribution of **T** plus the influence function. Since the expected value of the influence function is equal to zero, the expected value of the RIF will equal the corresponding distributional statistics, in our case quantile. The RIF's regression for the τ^{th} quantile of the distribution of **T** can be expressed as $E\left[RIF(T;q_\tau)|x\right]$ so that the unconditional or marginal quantile is equal to:

$$q_\tau = \int E\left[RIF\left(T;q_\tau,F_T\right)|x\right]\cdot dF\left(x\right) \qquad (5.10)$$

Empirical implementation requires two main assumptions for the counterfactual distribution to hold and make sensible interpretations. The conditional independence assumption of "ignorability" is to rule out the possible confounding effects of unobservable on observable characteristics. Second, the "overlapping support" assumption requires an overlap in covariates across groups, so that no observable variable uniquely identifies one of the groups only to be included (Fortin et al. 2010).

The expected value of the linear approximation of the RIF regression of the quantile of interest is equal to the expected value of the true conditional expectation, since the expected value of the approximation error is zero (Fortin et al. 2010). This allows for a simple and meaningful extension of the Oaxaca-Blinder decomposition to the

RIF regressions. The decomposition components of quantiles following OB approach can be written as:

The returns Effect

$$\Delta_R^{q_\tau} = \overline{X}_g.\left(\beta_b - \beta_g\right) \text{ , and}$$

The characteristics effect

$$\Delta_X^{q_\tau} = \left(\overline{X}_b - \overline{X}_g\right).\beta_b$$

Since this linear specification is a local approximation, the β estimation is based on different covariates distributions that may not hold if there are large changes in the covariate. This could lead to a bias in the decomposition. A reweighted decomposition analysis is also used to overcome non-linearity problems if they exist and to provide a robustness check of the base estimation.

The use of linear approximation allows for a detailed decomposition that separates the contribution of each single or group of covariate to the various elements of the aggregate decomposition. The returns and the characteristics effect detailed decomposition could be expressed as:

$$\begin{aligned} \Delta_R^{q_\tau} &= \sum_{k=2}^{K} \overline{X}_{gk}\left(\gamma_{gk,\tau} - \gamma_{bk,\tau}\right) \text{ ,} \\ \Delta_x^{q_\tau} &= \sum_{k=1}^{K}\left(\overline{X}_{gk} - \overline{X}_{bk}\right)\gamma_{bk,\tau} \end{aligned} \qquad \textbf{(5.11)}$$

The problem of omitted group choice for the dependant variables is present in quantile decomposition as for the mean. The solution for this problem is by using a sensible reasoning following the theory and literature. The RIF's regressions offer a path independent detailed decomposition, where the order of computing different elements of the detailed decomposition does not affect the results.

5.3.3.2 Recentered Influence Function RIF and Reweighting

The linearity assumption might not hold in all situations, preventing consistent estimates of coefficients and characteristics effects (Barsky et al. 2002). To overcome this problem, a hybrid of FFL recentered influence function decomposition and DFL reweighting approach is employed in this analysis. Reweighting is a way to

construct a counterfactual distribution. The idea is simply to reweight the group of interest to look like the other group and apply the decomposition of RIF. We may ask what the distribution of test scores of girls would look like if they had the same X's as boys. To estimate this counterfactual distribution a reweighting factor Ψ(X) is used to replace the marginal distribution of X for girls with the marginal distribution of X for boys.

$$\Psi(X) = \frac{\Pr(X \mid K_b = 1)}{\Pr(X \mid K_b = 0)} = \frac{\Pr(K_b = 1 \mid X) / \Pr(K_b = 1)}{\Pr(K_b = 0 \mid X) / \Pr(K_b = 0)} \quad \text{for K=b,g} \qquad \textit{(5.12)}$$

The reweighting factor could be estimated by a probability model of being a boy. Empirical applications suggest estimating probit or logit models, then using the estimated probabilities of being a boy to compute a reweighted value for each observation of girls group. In MENA gender decomposition, the counterfactual distribution of achievements of girls is constructed by reweighting the characteristics of girls so that they look like those of boys, holding the conditional distribution of girls fixed. When the boys group is used as reference the above specification is reversed. This is applied in our analysis to check that the choice of reference group does not have a major effect on the decomposition results. For the reweighting factor to be representative the reweighted sample should be tested for equality with the reweighting group and if found to be unequal, interactions should be included.

The characteristics effect and the coefficients effect for reweighted decomposition could be formally used to check the specification error and the reweighting error when compared to the estimates from OB decomposition without reweighting. In practice, a third sample of girls with boys' weights is constructed to run two Oaxaca decompositions from which we extract the pure characteristics and coefficient effects. The first is with boys sample and the reweighted sample to get the pure educational response effect. The second is with girls sample and the reweighted sample to get the pure composition effect. The characteristics effect is divided into a pure effect and a specification error component $\widehat{\Delta}^{q}_{X,e}$. Similarly, the coefficient

effect is divided into pure effect and reweighting error component $\widehat{\Delta}^{q}_{R,e}$ which goes to zero in large samples (Fortin et al. 2011). The characteristics effect is written as:

$$\Delta_X^{q\tau} = (\overline{X}_{01}\hat{\gamma}^q_{01} - \overline{X}_{0}\hat{\gamma}^q_{0}) + (\overline{X}_{01}\hat{\gamma}^q_{0} - \overline{X}_{01}\hat{\gamma}^q_{0}) \qquad (5.13)$$

$$= (\overline{X}_{01} - \overline{X}_{0})\hat{\gamma}^q_{0} + \overline{X}_{01}(\hat{\gamma}^q_{01} - \hat{\gamma}^q_{0})$$

$$= \widehat{\Delta}^{q}_{X,p} + \widehat{\Delta}^{q}_{X,e}$$

The returns effect is

$$\Delta_R^{q\tau} = (\overline{X}_{1}\hat{\gamma}^q_{1} - \overline{X}_{01}\hat{\gamma}^q_{01}) + (\overline{X}_{1}\hat{\gamma}^q_{01} - \overline{X}_{01}\hat{\gamma}^q_{01}) \qquad (5.14)$$

$$= \overline{X}_{1}(\hat{\gamma}^q_{1} - \hat{\gamma}^q_{01}) + (\overline{X}_{1} - \overline{X}_{01})\hat{\gamma}^q_{01}$$

$$= \widehat{\Delta}^{q}_{R,p} + \widehat{\Delta}^{q}_{R,e}$$

5.4 Empirical results

Decomposition results are split into two main specifications under the mean, one for the twofold decomposition and the other for the threefold decomposition, considering both boys and girls as the reference group. The quantile decomposition results are under two specifications; the first using the recentered influence function and the second employing a hybrid of RIF with reweighting. As a range of decomposition methods are applied for eight countries, many tables of econometric results are generated. All detailed results are presented in Appendix tables and summary tables (for mean decomposition) and preferred or baseline results (for the quantile decomposition) are included below.

As observed already, the eight MENA countries fall into three groups: three countries where girls outperform boys (Egypt, Jordan, Saudi Arabia), three where boys outperform girls (Algeria, Syria, and Tunisia), and two with no significant difference (Turkey and Iran). The results of similar countries will be discussed together and compared to the other groups. Turkey is taken as the benchmark country as there is no difference in achievements of boys and girls and the distribution of gender differences is very flat.

5.4.1 **Decomposition results of the mean gender gap**

Two decompositions of mean maths score differences between boys and girls are undertaken, with both boys and girls as the reference group. The Oaxaca-Blinder twofold decomposition distinguishes the characteristics (also called explained, endowment or composition) effect and the coefficient (unexplained, returns or educational response) effect. The threefold decomposition includes, in addition to these, the interaction effect. The score gap is defined as the difference between the predicted WLS score for the boys and the predicted WLS score for girls. Therefore the gap is positive if the boys perform better than girls and negative if boys perform worse. Appendix Table A-5.2 to Table A-5.9 present all results: the left part of the tables has the twofold decomposition and the right panel has the threefold decomposition.

Table 5.2: Maths test scores decomposition by gender in MENA

	Algeria	Syria	Tunisia	Turkey	Iran	Jordan	Saudi Arabia	Egypt
Boys	389.4	403.8	431.3	431.6	400.2	417.1	318.5	384
	(2.229)	(5.061)	(2.655)	(4.995)	(6.090)	(5.626)	(3.981)	(4.587)
Girls	384.1	387.3	410.4	432.1	407.2	437.6	341.4	397.3
	(2.422)	(4.390)	(2.769)	(5.288)	(5.295)	(6.420)	(3.614)	(4.995)
Difference	5.302***	16.43***	20.98***	-0.543	-6.987	-20.47**	-22.83***	-13.27**
	(1.805)	(5.653)	(2.408)	(3.888)	(8.059)	(8.832)	(5.008)	(6.445)
Characteristics	-1.749***	-1.760	-1.789	-8.694***	-0.394	11.91	11.86	-0.403
	(0.577)	(5.133)	(1.286)	(1.985)	(41.53)	(23.46)	(14.36)	(12.55)
Coefficient	7.050***	18.19***	22.77***	8.151**	-6.592	-32.38	-34.69**	-12.87
	(1.828)	(6.226)	(2.034)	(3.638)	(42.14)	(23.79)	(14.66)	(14.49)

Note: The gap equals boy minus girl so (+) favours boys and (-) favours girls, Jackknife Standard errors in () & (*** p<0.01, ** p<0.05, * p<0.1)

Table 5.3: Detailed decomposition results grouped into main categories

		Parents		Home		School		Constant	
Algeria	**Char.**	-0.219	(0.255)	-1.316***	(0.374)	0.555	(0.400)		
	Coef.	0.264	(3.319)	-0.0470	(4.796)	-25.81*	(15.47)	35.61*	(18.87)
Syria	**Char.**	0.471	(0.562)	-0.0156	(1.076)	0.299	(4.343)		
	Coef.	4.777	(8.260)	-4.717	(10.83)	-17.51	(106.7)	35.84	(112.4)
Tunisia	**Char.**	0.454	(0.313)	-0.597	(0.567)	-0.746	(0.572)		
	Coef.	2.591	(6.506)	-11.47*	(6.446)	-25.62	(20.87)	59.14***	(21.01)
Turkey	**Char.**	-1.269	(0.787)	-5.421***	(1.046)	-1.353	(0.916)		
	Coef.	-6.551	(7.843)	-17.48	(16.07)	-44.77	(40.05)	79.55*	(42.95)
Iran	**Char.**	-0.613	(0.872)	-1.970	(3.008)	6.216	(38.99)		
	Coef.	0.409	(5.127)	2.196	(8.770)	74.82	(57.77)	-86.43	(69.91)
Jordan	**Char.**	-0.554	(1.267)	-3.535	(2.181)	19.63	(21.69)		
	Coef.	5.959	(9.801)	-6.969	(17.71)	0.706	(101.7)	-29.90	(118.2)
Saudi Arabia	**Char.**	0.0228	(0.609)	-10.46***	(1.977)	19.80	(14.28)		
	Coef.	-10.02	(6.302)	16.28	(12.22)	45.79	(33.33)	-91.70**	(39.74)
Egypt	**Char.**	-0.781	(0.780)	0.128	(1.663)	5.898	(23.70)		
	Coef.	2.688	(7.253)	7.173	(11.57)	59.20	(219.1)	-92.92	(264.0)

Note: The gap equals boy minus girl so (+) favours boys and (-) favours girls, Jackknife Standard errors in

parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 5.4: Summary of mean test scores decomposition results across MENA

Class of prefer	variables	Algeria	Syria	Tunisia	Turkey	Iran	Jordan	Saudi Arabia	Egypt
Parents	Lower-sec EDC							-R	
	Upper-sec				-C	-C	-C BR		
	Post-sec not UNI						-C BR		
	University degree						+C		
	Native parents	NA	-C BR	-C BR	-C ,+R	+R	-R		+R
Home	One bookcases	-C			-C		-C BR	-C BRR	
	Two bookcases				-C, +R ,-I				
	Home possess High							-C, +R. +I	
	Home possess Medium	-C		-R,-C,GR			-C		
	TL spoken ALs				-C,-R	-C			+R
	PC at H&SCL			-C, GR				-C, BR	-C
	PC at H/SCL		+C		-C, BR			+C	+C
School (incl. Location)	T. Certificate	-R							
	Male teacher					-C	+R	+R	
	T. Experience								
	M SCL RCS							+R	-R
	L SCL RSC						-R		
	T. UNI Degree								
	COMMU.>50000								
	Disadv.		-R		-C				
	Class size					+R			
	Class size square								

Note: (+) indicates pro boy effect, (-) indicates pro girl effect, (C) indicates characteristics effect and (R) indicates Returns effect. GR: girls as reference and BR boys as reference. BRR boys as reference reweighted.

The performance gap is affected by coefficient and characteristics effects, Table 5.2 to 4.4 summarise the significant results of these effects. Countries presented by favouring order starting from left by countries favouring boys, no favouring, and favouring girls. The total gap (Table 5.2) indicates significant differentials of maths performance between boys and girls in six countries. Turkey and Iran do not exhibit gender performance differences on average. The total characteristics gap shows a significant effect only in Algeria and Turkey. That is if boys had similar characteristics to girls they would achieve better test scores in both countries. The characteristics effect is larger in Turkey compared to Algeria. The coefficient effect, which reflects the educational production process (the 'returns' to variables in the

EPF), generally, contributes more toward the gender performance gap. The coefficient effect advantages boys in Algeria, Syria, Tunisia and Turkey. That is, if girls had the same production process as boys they would achieve higher maths scores by the amount of the coefficient gap. However, this effect advantages girls in Saudi Arabia. That is, if a Saudi boy had the same education process as girls on average he would improve his maths score by 35 points.

Disaggregating total gaps by type of variables explain the sources of the overall effects. For gender neutral countries, Turkey has a relatively high number of significant variables (Appendix Table A-5.5). Although there is no mean difference, home and parents' characteristics tend to favour girls (indicated as –C in Table 5.4; Table 5.3 shows this is primarily due to the effect of home characteristics), i.e. girls tend to be from households with more favourable characteristics. However, boys with native parents and two bookcases at home tend to do better than girls with those characteristics, i.e. the coefficients favour boys (indicated by +R in Table 5.4, although Table 5.3 shows that home coefficients overall are insignificant); the exception is if the test language is always spoken at home, in which case girls do better (-R). Overall there is a trade-off (Table 5.2): characteristics tend to have an effect that favours girls but coefficients (returns) tend to favour boys. The significant constant (Table 5.3) indicates some generic effect that favours boys but is not captured by the variables included.

Few variables are significant for Iran (Appendix Table A-5.6) and neither characteristics nor coefficients are significant overall (Table 5.2 and 4.3). Some characteristics tend to favour girls (parental education, test language spoken at home and having a male teacher) whereas some coefficients tend to favour boys (they do better if they have native parents or in larger classes), as shown in Table 5.4. As there is no mean difference in these two countries the implication is that the differential effects of some characteristics (either values or coefficients) cancel out on average. If the characteristics are distributed differently for boys and girls we may observe score gaps at parts of the distribution. For example, if students with the lowest scores are more likely to be in disadvantaged areas we would expect girls to

do better at the lower end of the distribution in Turkey (-C on 'Disadv'). This is explored below.

There are few significant variables for countries where boys outperform girls, perhaps because the total mean gap between boys and girls is quite small for Algeria, Syria and Tunisia, at 5, 16, and 21 points respectively (Table 5.2). The total gap is mostly due to the differences in returns as the gap due to coefficients is significantly positive for Algeria (7 points), Syria (18) and Tunisia (23), whereas the total negative characteristics effect is small and only significant for Algeria (Table 4.3). However, the only significant individual coefficient effects favour girls (-R in Table 5.4), it is overall coefficient effects for schools (Algeria) and home (Tunisia) that account for the bias in favour of boys (Table 5.3). It is not possible to identify any specific factors explaining why boys do better in these countries; indeed girls tend to have some more favourable home characteristics than boys (Table 5.4). We consider below if this may be because of differential effects across the distribution.

A number of variables are significant for countries where girls do better (the final three countries in the tables, see Appendix Table A-5.7, Table A-5.8 and Table A-5.9 for details). The overall effect due to coefficients is negative and greater in absolute value than that due to characteristics, although only significant for Saudi Arabia (Table 5.2; Table 5.3 shows this is due to home factors), suggesting that insofar as there are significant indicators girls tend to do better because they tend to have better returns. However, individual significant characteristics (mostly related to home or parents) favour girls, although coefficients tend to favour boys (Table 5.4). There is a suggestion for Saudi Arabia, and to a lesser extent Jordan, that certain school factors can offset this to some extent (as coefficients favour boys). As for the other countries, the next sub-section explores if differences across the distribution help identify any core factors explaining gender differences.

5.4.2 **Decomposition results along the educational achievement distribution**

Quantile decomposition prevails to mean decomposition as it captures the gap along the distribution rather than only at the mean. The kernel density function distribution graphs in Figure 5-2, as well as the quantile differentials from Figures

4.2 and 4.3, show different overlaps between boys' and girls' maths scores distributions at different points. This might reflect differences across the upper and bottom tails of the scores distributions. The decomposition of maths achievements along 10th, 50th, and 90th quantiles reveals these expected gender differentials in MENA. The discussion of quantile results will follow the same country sequence of presentation as for the mean.

Quantile decompositions under two specifications are employed for maths scores gap between boys and girls, with both boys and girls as reference group. As discussed in the methods section, the first specification uses RIF and employs the decomposition technique suggested by FFL (2010). The modified hybrid decomposition under the second specification uses a combination of both the FFL decomposition based on RIF and the reweighting technique proposed by DFL (DiNardo et al. 1996) to handle the possible nonlinearity relation between the dependent variable with the explanatory variables.

The results of overall math gap decompositions across quantiles are presented in tables 4.5 to 4.7 using the RIF-reweighting technique (FFL&DFL) and boys as the reference group. Under this specification, the characteristics effect shows the differentials using covariates groups (parents, home and school) between boys and girls (boys distribution reweighted to look like girls) under the production process of boys (boys' coefficients estimates). That is, if girls have similar characteristics to boys how would they perform (better or worse)? The coefficients effect represents the differences between the coefficients of boys and girls (boys distribution reweighted to look like girls) evaluated at the girls' characteristics. That is to say if girls had the same education production process as boys, what they would achieve in maths? Appendix B Tables B4.1 to B4.18 presents all the detailed results using boys as the reference group in Tables B4.1 to B4.8 and girls as the reference in the remaining tables. Each table reports 10th, 50th and 90th quantiles under the two specifications.

The reweighted regression decomposition differs from the standard Oaxaca-Blinder decomposition in two ways. First, the specification error (equal to zero if the model

is linear) adjusts the characteristics effect if the model specification is not linear. Second, the returns effect is based on comparing coefficient estimates of the boys and the weighted estimate of boys sample to look like girls as shown in the methods section. The reweighting error is the complement to the pure returns effect and should go to zero when the reweighting factor is consistent.

a) **Countries with Pro-Boys Gap**

There are persistent and mostly significant gaps in maths performance across the distribution for countries where boys outperform girls; these tend to decrease as one moves up quantiles. The significant characteristics effect (attributable to home) tends to favour girls in Algeria and Tunisia but not in Syria (Table 5.5), but the coefficients effect favours boys overall in the three countries (significant except for the bottom quantile in Syria). That is, if boys have similar home characteristics to girls they would do better in maths scores, whereas, if girls had the same coefficients as boys they would attain better maths scores. Overall, the coefficients effect dominates the characteristics effect in Algeria, Tunisia, and Syria.

The significant characteristics effects favouring girls in Algeria are concentrated on the home background, where the numbers of books as an indicator of SES and home possessions as a proxy for families' wealth are the main driving forces (Appendix Table B-5.1). These differentials imply that relative to boys more girls are from better SES and wealthy families.

For Syria, overall characteristics and sub-groups (parents, home and school) are insignificant. Nonetheless, some significant background variables favour girls: more girls with high home possessions; more going to school in disadvantaged areas and boys at bottom and median have more access to computers either at school or at home. Total coefficient effect shows significant differences between boys and girls in median and top quantile. At the median, boys with native parents have higher returns (Appendix Table B-5.2), so perhaps parents favour boys.

Table 5.5 : Quantile Decomposition by Main Categories: countries where boys do better

		Algeria			Syria			Tunisia		
		10th Q	50th Q	90th Q	10th Q	50th Q	90th Q	10th Q	50th Q	90th Q
Boys		314.0	389.6	466.7	296.6	405.7	510.8	349.5	429.7	515.3
		(3.323)	(2.628)	(2.454)	(6.700)	(5.767)	(5.520)	(4.498)	(3.169)	(4.277)
Girls		307.5	382.9	461.9	285.9	385.0	492.6	326.1	407.1	499.9
		(3.221)	(2.819)	(2.582)	(6.494)	(4.977)	(5.169)	(3.338)	(3.189)	(3.814)
Difference		**6.537**	**6.653**	*4.812*	10.67	**20.73**	**18.22**	**23.46**	**22.52**	**15.38**
		(3.156)	(2.396)	(2.849)	(7.993)	(6.812)	(5.975)	(4.150)	(3.833)	(4.808)
Char.	Total	**-1.325**	**-1.395**	**-2.156**	-2.894	-0.00472	-0.800	**-2.150**	**-1.820**	-0.387
		(0.597)	(0.503)	(0.997)	(3.391)	(3.261)	(3.262)	(0.634)	(0.657)	(0.790)
	Parents	-0.365	-0.110	-0.299	*-1.327*	-0.385	0.405	-0.683	-0.566	0.443
		(0.325)	(0.279)	(0.444)	(0.713)	(0.628)	(0.739)	(0.482)	(0.380)	(0.345)
	Home	**-1.012**	**-1.233**	**-1.915**	0.692	0.372	-0.574	**-0.720**	**-0.672**	-0.394
		(0.422)	(0.364)	(0.705)	(1.038)	(0.881)	(0.952)	(0.345)	(0.260)	(0.384)
	School	0.622	0.481	0.528	-0.989	1.335	0.886	-0.555	**-0.702**	-0.703
		(0.552)	(0.393)	(0.447)	(2.889)	(3.344)	(3.133)	(0.371)	(0.327)	(0.462)
Specification error		0.0352	0.212	0.0276	-1.239	-0.285	-0.407	-0.415	-0.0120	-0.0567
		(0.621)	(0.518)	(0.935)	(1.843)	(1.088)	(1.578)	(0.847)	(0.340)	(0.416)
Coeff.	Total	**8.087**	**8.178**	**7.033**	13.58	**22.48**	*15.39*	**26.31**	**25.02**	**15.90**
		(3.193)	(2.278)	(3.104)	(9.484)	(8.133)	(9.324)	(4.095)	(3.399)	(4.242)
	Parents	3.391	-1.919	-0.402	20.98	21.47	6.023	21.05	19.94	0.313
		(7.694)	(4.907)	(6.489)	(22.41)	(14.04)	(19.57)	(27.38)	(14.94)	(21.20)
	Home	6.722	-0.132	0.284	-0.183	-6.647	-9.253	-16.06	-11.84	-8.545
		(9.665)	(6.416)	(8.062)	(26.97)	(15.59)	(17.61)	(15.31)	(8.278)	(8.011)
	School	-24.34	-25.09	-30.75	-20.14	-5.783	-26.23	-40.7	-28.24	13.21
		(44.96)	(30.65)	(23.53)	(102.7)	(120.3)	(120.8)	(34.80)	(64.15)	(75.08)
Reweighting error		-0.260	-0.341	-0.092	1.224	-1.463	4.039	-0.291	-0.668	-0.080
		(0.602)	(0.430)	(0.601)	(5.699)	(5.718)	(7.047)	(0.909)	(1.033)	(1.506)
Constant		24.48	39.05	42.16	13.5	14.11	51.77	*70.97*	45.97	8.491
		(50.01)	(37.34)	(29.12)	(105.3)	(130.5)	(130.1)	(40.16)	(62.47)	(72.46)

Note: 5% or higher significance is **bold**, 10% is *italic.* Jackknife standard errors in parenthesis.

For Tunisia, the overall coefficients effect which advantages boys dominates the characteristics effect which advantages girls across quantiles. The home characteristics effect favours girls with most of the subgroups of characteristics are significant (Appendix Table B-5.3). The coefficient effect variables show only significant effects for class size and its square term and the effects cancel out.

b) Countries with no gender gap

For Turkey (Table 5.6), there is no mean or quantile gender difference. Nonetheless, total characteristics effect advantages girls across quantiles. Disaggregating, home

and parents characteristics benefit girls along the distribution and school characteristics favour girls at the median and top quantile. On the other hand, the coefficients effect favours boys at the median and top of distribution (but insignificant for each group of factors). If girls had the same characteristics as boys they would perform worse, but if they had similar education process they would perform better.

The overall effect is insignificant since the characteristics and the coefficient effects cancel out. The detailed decomposition (Appendix Table B-5.4) implies no persistent pattern of results across quantiles. Compared to boys, girls at bottom quantiles are more likely to be from native families and always speak the test language (Turkish) at home. At the median, girls are more likely to be from more educated families, with more books at home, more wealthy families, and residents of poorer areas. At the top quantile, relative to boys there are more girls from well-educated families with more books at home who go to school in poorer areas.

For Iran, at the bottom quantile the total gap and coefficients effect are significant (at 10%) favouring girls. Disaggregating by the types of variable, only community type coefficient effect is significant, and is pro-girls in the bottom quantile (Appendix Table B-5.5). At the median the significant overall coefficients effect significantly favours girls; however, the significant coefficients (Appendix Table B-5.5) favour boys (who have books at home). The constant is significant at the median suggesting some generic effect that favours girls but is not captured by the variables included. At the top quantile, two specific characteristics effects favour boys (parents with university degrees and computer usage at home and school); that is to say if a similar proportion of girls as boys come from highly educated families and have more computer usage at home and school, they would perform better in maths by 8 and 4 test score points, respectively. The specification error and reweighting error are large in absolute values but insignificant, (discussed in the subsection 5.4.3).

Table 5.6: Quantile Decomposition by Main Categories: Countries with no Gender gap

		Turkey			Iran		
VARIABLES		10th Q	50th Q	90th Q	10th Q	50th Q	90th Q
Boys		295.9	424.3	584.1	287.5	397.8	517.4
		(4.821)	(5.205)	(8.536)	(7.344)	(6.456)	(9.796)
Girls		298.1	424.3	577.7	303.7	404.5	514.9
		(7.729)	(6.057)	(7.330)	(5.504)	(5.387)	(10.17)
Difference		-2.190	-0.0535	6.344	*-16.24*	-6.689	2.475
		(6.928)	(4.704)	(7.251)	*(9.314)*	(8.398)	(14.02)
Char.	Total	**-5.654**	**-10.08**	**-10.32**	66.30	60.13	60.14
		(1.564)	(1.231)	(1.882)	(75.28)	(85.85)	(69.05)
	Parents	*-1.300*	**-2.003**	**-1.947**	0.742	3.950	14.20
		(0.786)	(0.591)	(0.631)	(3.540)	(4.671)	(16.60)
	Home	**-3.069**	**-6.105**	**-5.985**	12.53	20.16	21.61
		(1.372)	(1.019)	(1.492)	(20.35)	(29.59)	(23.26)
	School	-0.692	**-1.652**	*-2.044*	58.97	39.48	24.61
		(0.526)	(0.638)	*(1.087)*	(65.40)	(60.48)	(43.62)
Specification error		-0.0758	-0.245	0.744	-12.74	38.92	69.76
		(1.736)	(1.480)	(2.365)	(63.72)	(52.29)	(107.0)
Coeff.	Total	4.147	**9.724**	*14.73*	*-63.05*	**-73.11**	-21.31
		(7.007)	(4.400)	(7.627)	(33.34)	(33.48)	(78.97)
	Parents	63.17	33.59	-0.641	11.04	23.44	-68.43
		(53.32)	(29.15)	(30.80)	(39.06)	(44.53)	(206.1)
	Home	-58.48	-5.044	4.201	-27.84	-23.56	-1.405
		(38.02)	(19.23)	(23.31)	(31.63)	(15.27)	(53.93)
	School	-115.9	-6.92	-78.34	-27.61	38.33	131.6
		(124.0)	(86.69)	(84.80)	(79.69)	(62.72)	(159.9)
Reweighting error		-0.607	0.550	1.194	-6.753	-32.630	-106.100
		(1.770)	(1.953)	(2.575)	(20.12)	(25.50)	(117.1)
Constant		117.4	-10.85	96.29	-25.09	*-112.3*	-69.71
		(110.2)	(97.19)	(101.8)	(72.93)	(65.55)	(328.2)

Note: 5% or higher significance is **bold**, 10% is *italic*. Jackknife standard errors in parenthesis.

c) Countries with pro-girls gap

There are some differences across quantiles for countries where girls outperform boys (Table 5.7). The overall significant gender gap in performance decreases across quantiles in the three countries except for the top quantile in Jordan and Egypt. Overall effects due to characteristics and coefficient are insignificant except for the median coefficients effect in Saudi Arabia.

For Jordan, the quantiles' detailed decomposition (Appendix Table B-5.6) does not identify any individual characteristic that favours girls. Only one coefficient

significantly favours girls (being resident of a larger community compared to small at the median).

Table 5.7: Quantile Decomposition by Main Categories: Countries with pro-girls gap

		Jordan			Saudi Arabia			Egypt		
VARIABLES		10th Q	50th Q	90th Q	10th Q	50th Q	90th Q	10th Q	50th Q	90th Q
Boys		274.0	422.9	551.7	216.9	317.7	423.5	248.7	384.8	517.0
		(7.372)	(6.733)	(4.355)	(5.569)	(5.359)	(4.361)	(7.345)	(5.288)	(5.725)
Girls		311.9	441.2	559.9	250.8	342.0	434.1	266.1	399.2	524.1
		(8.635)	(7.779)	(5.762)	(5.555)	(4.030)	(3.902)	(7.242)	(6.077)	(4.614)
Difference		**-37.86**	*-18.38*	-8.183	**-33.88**	**-24.27**	*-10.55*	*-17.38*	*-14.37*	-7.164
		(10.99)	(10.53)	(7.273)	(7.671)	(7.012)	(5.760)	(9.133)	(7.599)	(7.788)
Char.	Total	18.51	-4.246	-2.832	-1.477	13.65	-9.293	-4.031	-3.588	0.823
		(25.79)	(28.49)	(18.06)	(35.21)	(15.43)	(42.98)	(4.400)	(2.847)	(2.527)
	Parents	-2.466	-2.223	-2.528	1.073	7.453	**15.22**	**-2.290**	**-4.228**	**-2.082**
		(2.148)	(3.489)	(2.957)	(5.518)	(5.588)	(8.347)	(0.831)	(0.645)	(0.666)
	Home	-6.177	-8.957	-3.673	-4.638	-0.581	-1.444	0.378	-0.871	0.164
		(7.161)	(10.38)	(5.652)	(5.385)	(5.493)	(7.476)	(1.287)	(0.989)	(1.065)
	School	14.34	3.741	7.610	19.40	24.68	-9.691	8.848	11.08	0.525
		(21.76)	(24.68)	(16.68)	(38.42)	(18.86)	(38.27)	(38.63)	(37.25)	(9.872)
Specification errror		-3.584	3.663	5.902	-48.68	**-114.1**	-18.70	-0.689	0.642	0.0373
		(9.892)	(10.71)	(8.817)	(59.00)	(24.91)	(44.13)	(1.342)	(1.273)	(1.217)
Coeff.	Total	-15.00	-22.95	-28.07	48.44	**115.1**	114.1	-15.16	-13.82	7.243
		(26.72)	(48.78)	(32.72)	(195.2)	(18.45)	(83.30)	(13.47)	(23.31)	(9.706)
	Parents	110.6	57.15	0.604	12.74	-8.199	25.88	9.373	**33.71**	21.35
		(108.1)	(66.52)	(26.89)	(180.2)	(23.24)	(32.42)	(26.11)	(14.89)	(16.81)
	Home	37.38	-129.1	54.42	30.26	1.513	84.01	-2.974	5.199	19.61
		(138.9)	(147.1)	(64.61)	(178.1)	(22.04)	(73.35)	(23.75)	(20.86)	(19.26)
	School	58.02	-190.7	155.5	194.6	50.76	**109.3**	143.8	162.4	-100.3
		(184.1)	(276.1)	(417.6)	(341.4)	(52.80)	(50.80)	(190.7)	(375.5)	(98.59)
Reweighting error		-37.780	5.151	16.820	-32.170	**-38.93**	-96.680	2.497	2.396	-0.781
		(34.74)	(58.91)	(32.07)	(176.2)	**(13.84)**	(71.07)	(11.81)	(22.62)	(6.461)
Constant		-246.6	254.3	-249.2	-233.2	70.66	-117.1	-181.5	-235.0	62.06
		(252.3)	(317.1)	(476.0)	(686.5)	(69.64)	(73.63)	(224.8)	(447.9)	(115.3)

Note: 5% or higher significance is **bold**, 10% is *italic.* Jackknife standard errors in parenthesis.

For Saudi Arabia, the overall effect due to coefficients is significant at the median with significant specification and reweighting error indicating problems with the weighting factor and large reweighted error difference indicating probability of nonlinear relationship between maths scores and the covariates. These issues are addressed below. At the top quantile, parents' characteristics and returns to schools characteristics favour boys.

For Egypt, the overall effects due to characteristics and coefficients are insignificant; some individual parents and home characteristics are significant across quantiles and favour girls. The coefficient effects are mixed: medium school resources returns favour girls compared to high school resources at median and top quantile; returns to disadvantaged poor area schools favour boys at top quantile and native parents' returns at median advantage boys.

5.4.3 **Quantile decomposition results for Saudi Arabia and Iran (without teachers' variables)**

The estimates of the uniform quantile decompositions across MENA countries indicate some large specification error and reweighting error for Saudi Arabia and Iran. The misspecification of the reweighting factor implies reweighting error and the specification error suggests a nonlinear relationship. The two countries have single sex education system where boys and girls attend separate schools. This is related to teacher's gender as they should be the same as student's gender. The overlapping assumption required for the decomposition to be consistent might be violated by including teacher's covariates in the regressions estimates, so estimates without teachers' covariates are presented in Table 5.8. The specification and reweighting errors are now insignificant and this supports the argument of the gender separation effect related to teachers' covariates.

There are changes in the detailed decomposition results for Saudi Arabia and Iran: the overall effect due to characteristics is significant in favour of girls across quantiles in Saudi Arabia and at the median for Iran. The coefficient effect is larger than characteristics effect at bottom and median favouring girls in Saudi Arabia. The total significant gap between boys and girls at the bottom quantile in Iran is mostly driven by the coefficient effect. At the median in Iran, however the total differentials gap is insignificant, the overall effect due to characteristics is significant and favouring girls. The significant effects of characteristics are mostly driven by the home characteristics that favour girls in both countries. The only significant effect of coefficient is for Iranian parents favouring boys.

Table 5.8: Quantile Decomposition by Main Categories: Saudi Arabia and Iran (without teachers' variables)

		Saudi Arabia			Iran		
VARIABLES		10th Q	50th Q	90th Q	10th Q	50th Q	90th Q
Boys		216.9	317.7	423.5	287.5	397.8	517.4
		(5.569)	(5.359)	(4.361)	(7.344)	(6.456)	(9.796)
Girls		250.8	342.0	434.1	303.7	404.5	514.9
		(5.555)	(4.030)	(3.902)	(5.504)	(5.387)	(10.17)
Difference		**-33.88**	**-24.27**	*-10.55*	*-16.24*	-6.689	2.475
		(7.671)	(7.012)	*(5.760)*	*(9.314)*	(8.398)	(14.02)
Char.	Total	**-8.711**	**-7.853**	**-7.890**	-2.966	*-4.477*	-4.741
		(4.187)	**(2.676)**	**(3.023)**	(2.661)	*(2.049)*	(3.156)
	Parents	0.327	0.369	1.325	-0.454	**-0.954**	-0.739
		(0.808)	(0.756)	(0.960)	(0.548)	**(0.457)**	(0.770)
	Home	**-10.10**	**-9.769**	**-10.77**	**-2.407**	**-2.412**	-2.144
		(2.719)	**(1.592)**	**(2.854)**	**(1.041)**	**(1.228)**	(1.601)
	School	0.0677	0.851	0.676	0.836	-0.768	-1.820
		(2.476)	(1.952)	(1.944)	(1.970)	(1.614)	(2.003)
Specification error		2.363	1.332	1.839	-0.0782	-0.0772	0.614
		(2.323)	(2.309)	(2.183)	(1.465)	(1.367)	(2.705)
Coeff.	Total	**-33.70**	**-22.78**	-7.794	**-15.33**	1.336	11.92
		(11.25)	**(7.109)**	(8.031)	**(7.668)**	(6.818)	(9.614)
	Parents	-0.676	-8.123	-27.59	31.66	*41.11*	12.00
		(22.88)	(13.27)	(17.45)	(35.15)	*(23.51)*	(21.31)
	Home	22.56	8.300	22.64	8.527	10.03	-5.624
		(28.04)	(20.51)	(14.23)	(13.47)	(10.72)	(14.70)
	School	37.03	46.96	29.96	63.35	15.18	76.60
		(46.16)	(31.83)	(48.47)	(83.85)	(64.49)	(71.36)
Reweighting error		6.165	5.027	3.290	2.130	-3.470	-5.320
		(8.513)	(5.669)	(7.066)	(5.503)	(6.714)	(9.232)
Constant		*-99.63*	*-74.18*	-35.42	-118.9	-68.87	-75.88
		(53.75)	*(40.10)*	(59.43)	(84.82)	(70.55)	(79.53)

Note: 5% or higher significance is **bold**, 10% is *italic.* Jackknife standard errors in parenthesis.

5.5 Conclusion

This chapter analyses the differences between maths test scores of boys and girls for Algeria, Egypt, Jordan, Iran, Saudi Arabia, Syria, Tunisia and Turkey with mean and quantile gender gap decompositions. The decomposition estimates present a mixed picture within and across countries so it is difficult to identify a general pattern of the determinants of gender inequalities in MENA. In part this is because decomposition analysis is complicated by the need for distributional assumptions. It is also because the TIMSS test scores are difficult to analyse as one has to use the

range of plausible values. Mostly, however, it is because the determinants of test scores, and hence of gender differences, are difficult to identify for any country and there are notable differences across countries (including cultural and traditions). Given these caveats, some tentative implications can be drawn.

The gender-gap of students' maths test scores split MENA selected countries into three groups: first, pro-boys countries where the maths achievements gap is in favour of boys (Algeria, Syria and Tunisia); second, pro-girls countries where girls outperform boys (Jordan, Saudi Arabia and Egypt); third, gender neutral countries (Iran and Turkey). In countries where girls outperform boys the gender gap in performance is greater than that of pro-boys countries.

The gender gap of maths performance is not always consistent with the findings of the gender indicator from the education production functions for some countries. In chapter 3, control for school, teacher and home background variables in the education production function and find that student's gender indicator shows a significant effect on academic achievement in five of the eight countries. A positive significant effect indicating boys outperform girls is found in Algeria, Syria, Tunisia where the gap is pro-boy, but also Turkey; a negative effect so that girls outperform boys is found in Egypt (which is pro-girl); the coefficient is insignificant in Saudi Arabia, Iran and Jordan. The gender effect is in favour of boys when controlling for the unobservable school variables in the school fixed effects model for Iran.

These findings have been investigated in detail through gender decomposition analysis of the maths achievements on the mean and across the distribution by quantile regression. In countries where there is a pro-boys gap, the coefficients effect at the mean and across quantiles dominates the characteristics effect, which suggests that the transformation process of certain variables favours boys, though none of the covariates' groups show significant effects. From the policy point of view, the school effect for these countries does not show any significant effect. The coefficients effect confirms the findings from the education production functions that the gender effect is favouring boys in Algeria, Syria, Tunisia and Turkey.

The pro-girls countries show the same patterns in general. Although, gender indicators were insignificant in Jordan, Saudi Arabia and Iran, the quantile decomposition implies that gender gaps are not consistent across quantiles and supports the average effect on the production functions. The large gaps at the bottom quantiles and the median for Saudi Arabia and Jordan compared to the top suggest possible pure differences between boys and girls which could be neutralized by the top quantile small gap to imply insignificant effect of the gender indicator.

There is a general tendency of the gender gap to close toward the top quantile in almost all countries except for Syria. The general conclusion to be drawn from this analysis is that though there is a gender gap in learning, there are no clear patterns or factors influencing this gap from our controls. The mechanisms by which the gaps are created might need more investigation in terms of, for example, the school type and private or group tutoring which might not be captured by decomposition analysis.

Appendix A-4: Mean Decompositions

Table A-5.1: Descriptive statistics of tests scores in MENA countries

	Algeria		Egypt		Iran		Jordan		Saudi Arabia		Syria		Tunisia		Turkey	
Boy(B),Girl(G)	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
N (%)	49	51	49	51	46	54	48	52	48	52	52	48	52	48	47	53
mean	385	390	399	384	407	400	438	418	343	320	389	404	410	432	431	432
max	574	580	707	743	678	727	694	746	550	587	624	678	641	624	820	831
min	90	216	87	75	157	163	128	41	108	94	142	121	214	213	121	112
range	484	363	620	668	521	564	566	705	443	493	482	557	427	411	699	718
s.d.	59	57	97	101	82	89	95	106	70	79	80	84	67	63	106	109
se(mean)	1.14	1.09	1.69	1.75	1.94	1.90	1.80	2.14	1.47	1.76	1.61	1.74	1.46	1.42	2.32	2.23
skewness	0.06	0.04	-0.08	-0.04	0.25	0.16	-0.17	-0.20	-0.05	0.00	0.01	-0.07	0.19	0.05	0.23	0.31
kurtosis	2.98	2.82	2.61	2.64	2.93	2.86	2.65	2.55	2.74	2.80	2.85	2.89	2.82	2.86	2.68	2.89
p10	310	317	269	250	307	285	312	275	255	220	290	297	325	352	300	297
p25	345	351	333	311	347	339	372	340	294	266	335	345	364	389	356	356
p50	383	390	400	386	404	399	440	420	344	319	387	406	405	431	422	424
p75	425	428	470	456	461	457	509	501	393	374	444	463	457	474	506	503
p90	463	467	524	513	514	516	558	551	433	425	494	513	500	514	575	581
CV	15.32	14.62	24.31	26.30	20.15	22.25	21.69	25.36	20.41	24.69	20.57	20.79	16.34	14.58	24.59	25.23

Table A-5.2: Algeria Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	0.00565	-0.681	0.00381	-0.679	0.00381	-0.681	0.00184	0.00565	-0.679	-0.00184
	(0.109)	(1.378)	(0.101)	(1.377)	(0.101)	(1.378)	(0.0103)	(0.109)	(1.377)	(0.0103)
Upper-sec	-0.156	0.593	-0.0579	0.495	-0.0579	0.593	-0.0980	-0.156	0.495	0.0980
	(0.159)	(1.264)	(0.152)	(1.055)	(0.152)	(1.264)	(0.213)	(0.159)	(1.055)	(0.213)
Post-sec not UNI	-0.110	-0.177	-0.143	-0.144	-0.143	-0.177	0.0329	-0.110	-0.144	-0.0329
	(0.115)	(0.949)	(0.148)	(0.774)	(0.148)	(0.949)	(0.176)	(0.115)	(0.774)	(0.176)
University degree	0.0414	0.529	-0.0526	0.623	-0.0526	0.529	0.0940	0.0414	0.623	-0.0940
	(0.0916)	(0.773)	(0.131)	(0.909)	(0.131)	(0.773)	(0.140)	(0.0916)	(0.909)	(0.140)
One bookcases	-0.715**	1.140	-0.421**	0.846	-0.421**	1.140	-0.294	-0.715**	0.846	0.294
	(0.292)	(1.038)	(0.183)	(0.762)	(0.183)	(1.038)	(0.286)	(0.292)	(0.762)	(0.286)
Two bookcases	-0.0324	-0.113	-0.0444	-0.101	-0.0444	-0.113	0.0119	-0.0324	-0.101	-0.0119
	(0.0467)	(0.550)	(0.0445)	(0.491)	(0.0445)	(0.550)	(0.0597)	(0.0467)	(0.491)	(0.0597)
Home possess H	0.0482	-1.656	0.0664	-1.674	0.0664	-1.656	-0.0182	0.0482	-1.674	0.0182
	(0.166)	(2.145)	(0.254)	(2.172)	(0.254)	(2.145)	(0.0931)	(0.166)	(2.172)	(0.0931)
Home possess M	-0.354*	1.033	-0.307	0.987	-0.307	1.033	-0.0468	-0.354*	0.987	0.0468
	(0.214)	(3.266)	(0.205)	(3.116)	(0.205)	(3.266)	(0.152)	(0.214)	(3.116)	(0.152)
TL spoken Als	-0.00515	-0.662	0.0518	-0.719	0.0518	-0.662	-0.0570	-0.00515	-0.719	0.0570
	(0.0818)	(1.678)	(0.121)	(1.829)	(0.121)	(1.678)	(0.155)	(0.0818)	(1.829)	(0.155)
PC at H&SCL	-0.245*	0.333	-0.418	0.507	-0.418	0.333	0.174	-0.245*	0.507	-0.174
	(0.148)	(0.430)	(0.255)	(0.654)	(0.255)	(0.430)	(0.239)	(0.148)	(0.654)	(0.239)
PC at H/SCL	-0.0130	-0.124	-0.0115	-0.125	-0.0115	-0.124	-0.00146	-0.0130	-0.125	0.00146
	(0.0544)	(1.478)	(0.0738)	(1.496)	(0.0738)	(1.478)	(0.0283)	(0.0544)	(1.496)	(0.0283)
Male teacher	0.110	-0.260	0.122	-0.272	0.122	-0.260	-0.0118	0.110	-0.272	0.0118
	(0.109)	(2.583)	(0.168)	(2.706)	(0.168)	(2.583)	(0.130)	(0.109)	(2.706)	(0.130)
T. Experience	-0.0119	0.204	-0.0124	0.205	-0.0124	0.204	0.000484	-0.0119	0.205	-0.000484
	(0.0905)	(3.918)	(0.0868)	(3.921)	(0.0868)	(3.918)	(0.0126)	(0.0905)	(3.921)	(0.0126)
T. Certificate!	-0.000789	-4.735*	0.0427	-4.778*	0.0427	-4.735*	-0.0435	-0.000789	-4.778*	0.0435
	(0.0276)	(2.485)	(0.125)	(2.532)	(0.125)	(2.485)	(0.136)	(0.0276)	(2.532)	(0.136)
M SCL RCS	0.0288	-2.021	0.0101	-2.002	0.0101	-2.021	0.0187	0.0288	-2.002	-0.0187
	(0.0450)	(4.420)	(0.0512)	(4.384)	(0.0512)	(4.420)	(0.0381)	(0.0450)	(4.384)	(0.0381)
L SCL RSC	-0.0172	0.663	0.0113	0.634	0.0113	0.663	-0.0285	-0.0172	0.634	0.0285
	(0.0353)	(0.688)	(0.0407)	(0.656)	(0.0407)	(0.688)	(0.0491)	(0.0353)	(0.656)	(0.0491)
T. UNI Degree	-0.00923	0.381	-0.0286	0.401	-0.0286	0.381	0.0194	-0.00923	0.401	-0.0194
	(0.0431)	(0.701)	(0.0534)	(0.735)	(0.0534)	(0.701)	(0.0355)	(0.0431)	(0.735)	(0.0355)
COMMU.>50000	0.0163	-2.482	-0.0522	-2.414	-0.0522	-2.482	0.0685	0.0163	-2.414	-0.0685
	(0.0482)	(1.777)	(0.0820)	(1.736)	(0.0820)	(1.777)	(0.0906)	(0.0482)	(1.736)	(0.0906)
Disadv	-0.00304	-0.873	-0.0184	-0.858	-0.0184	-0.873	0.0154	-0.00304	-0.858	-0.0154
	(0.0364)	(1.817)	(0.0533)	(1.794)	(0.0533)	(1.817)	(0.0434)	(0.0364)	(1.794)	(0.0434)
Class size	0.568	-38.13	1.183	-38.75	1.183	-38.13	-0.615	0.568	-38.75	0.615
	(0.739)	(34.17)	(1.082)	(34.69)	(1.082)	(34.17)	(0.630)	(0.739)	(34.69)	(0.630)
Class size sq	-0.126	21.44	-0.382	21.70	-0.382	21.44	0.256	-0.126	21.70	-0.256
	(0.332)	(22.66)	(0.555)	(22.91)	(0.555)	(22.66)	(0.355)	(0.332)	(22.91)	(0.355)
Constant		35.61*		35.61*			35.61*			35.61*
		(18.87)		(18.87)			(18.87)			(18.87)
Total (Expl/Unexpl)	-1.749***	7.050***	-1.327**	6.629***	-1.327**	7.050***	-0.422	-1.749***	6.629***	0.422
	(0.577)	(1.828)	(0.566)	(1.816)	(0.566)	(1.828)	(0.661)	(0.577)	(1.816)	(0.661)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	389.4	384.1	5.302***				389.4	384.1	5.302***	
	(2.229)	(2.422)	(1.805)				(2.229)	(2.422)	(1.805)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (parents nationality not included in Algeria) dummy for missing included.

Table A-5.3: Syria Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	-0.0310	0.734	0.00730	0.696	0.00730	0.734	-0.0383	-0.0310	0.696	0.0383
	(0.119)	(2.460)	(0.0975)	(2.333)	(0.0975)	(2.460)	(0.133)	(0.119)	(2.333)	(0.133)
Upper-sec	0.0960	1.765	0.375	1.486	0.375	1.765	-0.279	0.0960	1.486	0.279
	(0.347)	(2.528)	(0.308)	(2.121)	(0.308)	(2.528)	(0.409)	(0.347)	(2.121)	(0.409)
Post-sec not UNI	0.373	2.339	0.182	2.530	0.182	2.339	0.191	0.373	2.530	-0.191
	(0.334)	(2.426)	(0.234)	(2.631)	(0.234)	(2.426)	(0.217)	(0.334)	(2.631)	(0.217)
University degree	0.00259	0.181	0.00243	0.182	0.00243	0.181	0.000160	0.00259	0.182	-0.000160
	(0.320)	(1.666)	(0.359)	(1.662)	(0.359)	(1.666)	(0.0448)	(0.320)	(1.662)	(0.0448)
Native parents	-1.129**	9.430	-0.601	8.903	-0.601	9.430	-0.527	-1.129**	8.903	0.527
	(0.532)	(6.965)	(0.394)	(6.576)	(0.394)	(6.965)	(0.450)	(0.532)	(6.576)	(0.450)
One bookcases	-0.0666	-0.395	-0.0864	-0.375	-0.0864	-0.395	0.0198	-0.0666	-0.375	-0.0198
	(0.101)	(1.646)	(0.129)	(1.558)	(0.129)	(1.646)	(0.0902)	(0.101)	(1.558)	(0.0902)
Two bookcases	-0.0179	0.409	0.00119	0.390	0.00119	0.409	-0.0191	-0.0179	0.390	0.0191
	(0.0571)	(0.952)	(0.0416)	(0.906)	(0.0416)	(0.952)	(0.0840)	(0.0571)	(0.906)	(0.0840)
Home possess H	-1.883	0.583	-1.806	0.506	-1.806	0.583	-0.0769	-1.883	0.506	0.0769
	(1.288)	(3.853)	(1.236)	(3.373)	(1.236)	(3.853)	(0.485)	(1.288)	(3.373)	(0.485)
Home possess M	0.429	1.417	0.384	1.462	0.384	1.417	0.0442	0.429	1.462	-0.0442
	(0.615)	(4.344)	(0.500)	(4.493)	(0.500)	(4.344)	(0.174)	(0.615)	(4.493)	(0.174)
TL spoken Als	0.150	2.651	-0.000406	2.801	-0.000406	2.651	0.151	0.150	2.801	-0.151
	(0.311)	(5.908)	(0.229)	(6.224)	(0.229)	(5.908)	(0.335)	(0.311)	(6.224)	(0.335)
PC at H&SCL	0.328	-3.167	0.155	-2.995	0.155	-3.167	0.173	0.328	-2.995	-0.173
	(0.415)	(3.515)	(0.423)	(3.322)	(0.423)	(3.515)	(0.194)	(0.415)	(3.322)	(0.194)
PC at H/SCL	1.057*	-6.237	0.359	-5.539	0.359	-6.237	0.698	1.057*	-5.539	-0.698
	(0.572)	(3.882)	(0.390)	(3.413)	(0.390)	(3.882)	(0.535)	(0.572)	(3.413)	(0.535)
Male teacher	1.332	5.076	-1.340	7.749	-1.340	5.076	2.673	1.332	7.749	-2.673
	(2.062)	(4.528)	(1.741)	(6.708)	(1.741)	(4.528)	(2.305)	(2.062)	(6.708)	(2.305)
T. Experience	0.134	-11.87	-0.907	-10.83	-0.907	-11.87	1.041	0.134	-10.83	-1.041
	(0.778)	(10.40)	(1.295)	(9.549)	(1.295)	(10.40)	(1.502)	(0.778)	(9.549)	(1.502)
T. Certificate!	0.190	-2.959	0.125	-2.893	0.125	-2.959	0.0655	0.190	-2.893	-0.0655
	(0.627)	(10.08)	(0.329)	(9.970)	(0.329)	(10.08)	(0.432)	(0.627)	(9.970)	(0.432)
M SCL RCS	0.00862	-11.63	0.0924	-11.72	0.0924	-11.63	-0.0837	0.00862	-11.72	0.0837
	(0.129)	(18.59)	(0.968)	(18.74)	(0.968)	(18.59)	(0.919)	(0.129)	(18.74)	(0.919)
L SCL RSC	0.0248	-0.736	2.163	-2.875	2.163	-0.736	-2.139	0.0248	-2.875	2.139
	(1.639)	(0.926)	(2.674)	(3.948)	(2.674)	(0.926)	(3.107)	(1.639)	(3.948)	(3.107)
T. UNI Degree	0.953	2.759	0.463	3.248	0.463	2.759	0.489	0.953	3.248	-0.489
	(1.003)	(4.622)	(0.786)	(5.450)	(0.786)	(4.622)	(0.878)	(1.003)	(5.450)	(0.878)
COMMU.>50000	0.142	2.411	0.395	2.158	0.395	2.411	-0.253	0.142	2.158	0.253
	(0.455)	(5.542)	(0.775)	(5.009)	(0.775)	(5.542)	(0.674)	(0.455)	(5.009)	(0.674)
Disadv	-3.889	-9.660*	-1.250	-12.30*	-1.250	-9.660*	-2.639	-3.889	-12.30*	2.639
	(2.976)	(5.590)	(1.216)	(6.973)	(1.216)	(5.590)	(2.529)	(2.976)	(6.973)	(2.529)
Class size	3.612	55.55	6.081	53.08	6.081	55.55	-2.468	3.612	53.08	2.468
	(3.642)	(222.0)	(12.71)	(211.2)	(12.71)	(222.0)	(11.08)	(3.642)	(211.2)	(11.08)
Class size sq	-1.727	-33.52	-3.707	-31.54	-3.707	-33.52	1.979	-1.727	-31.54	-1.979
	(2.453)	(127.2)	(9.054)	(119.6)	(9.054)	(127.2)	(7.974)	(2.453)	(119.6)	(7.974)
Constant		12.95		12.95			12.95			12.95
		(112.7)		(112.7)			(112.7)			(112.7)
Total (char/coef)	-1.760	18.19***	-0.507	16.94**	-0.507	18.19***	-1.253	-1.760	16.94**	1.253
	(5.133)	(6.226)	(5.524)	(6.892)	(5.524)	(6.226)	(6.226)	(5.133)	(6.892)	(5.261)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	403.8	387.3	16.43***				403.8	387.3	16.43***	
	(5.061)	(4.390)	(5.653)				(5.061)	(4.390)	(5.653)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A-5.4: Tunisia Mean decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	0.234	1.315	0.384	1.165	0.384	1.315	-0.150	0.234	1.165	0.150
	(0.220)	(2.432)	(0.280)	(2.161)	(0.280)	(2.432)	(0.279)	(0.220)	(2.161)	(0.279)
Upper-sec	0.0272	2.503	0.157	2.374	0.157	2.503	-0.130	0.0272	2.374	0.130
	(0.0942)	(2.052)	(0.157)	(1.938)	(0.157)	(2.052)	(0.138)	(0.0942)	(1.938)	(0.138)
Post-sec not UNI	-0.00284	-0.818	0.0176	-0.838	0.0176	-0.818	-0.0205	-0.00284	-0.838	0.0205
	(0.0449)	(1.577)	(0.0541)	(1.623)	(0.0541)	(1.577)	(0.0904)	(0.0449)	(1.623)	(0.0904)
University degree	0.182	0.0261	0.179	0.0296	0.179	0.0261	0.00356	0.182	0.0296	-0.00356
	(0.174)	(1.248)	(0.206)	(1.420)	(0.206)	(1.248)	(0.173)	(0.174)	(1.420)	(0.173)
Native parents	-0.780**	11.11	-0.467	10.79	-0.467	11.11	-0.313	-0.780**	10.79	0.313
	(0.378)	(7.716)	(0.318)	(7.506)	(0.318)	(7.716)	(0.228)	(0.378)	(7.506)	(0.228)
One bookcases	-0.432*	0.502	-0.379*	0.450	-0.379*	0.502	-0.0527	-0.432*	0.450	0.0527
	(0.230)	(1.566)	(0.230)	(1.402)	(0.230)	(1.566)	(0.165)	(0.230)	(1.402)	(0.165)
Two bookcases	0.264	-1.030	0.404	-1.170	0.404	-1.030	-0.140	0.264	-1.170	0.140
	(0.275)	(0.748)	(0.398)	(0.835)	(0.398)	(0.748)	(0.162)	(0.275)	(0.835)	(0.162)
Home possess H	0.647	-4.835	0.992	-5.180	0.992	-4.835	-0.345	0.647	-5.180	0.345
	(0.442)	(3.149)	(0.713)	(3.366)	(0.713)	(3.149)	(0.357)	(0.442)	(3.366)	(0.357)
Home possess M	-0.272	-7.033*	-0.716*	-6.589*	-0.716*	-7.033*	0.444	-0.272	-6.589*	-0.444
	(0.200)	(3.713)	(0.423)	(3.498)	(0.423)	(3.713)	(0.340)	(0.200)	(3.498)	(0.340)
TL spoken Als	-0.200	0.0264	-0.205	0.0310	-0.205	0.0264	0.00462	-0.200	0.0310	-0.00462
	(0.188)	(0.635)	(0.172)	(0.751)	(0.172)	(0.635)	(0.116)	(0.188)	(0.751)	(0.116)
PC at H&SCL	-0.290	-0.0193	-0.283*	-0.0258	-0.283*	-0.0193	-0.00650	-0.290	-0.0258	0.00650
	(0.184)	(0.394)	(0.167)	(0.524)	(0.167)	(0.394)	(0.133)	(0.184)	(0.524)	(0.133)
PC at H/SCL	-0.283	-0.978	-0.233	-1.028	-0.233	-0.978	-0.0496	-0.283	-1.028	0.0496
	(0.216)	(2.266)	(0.222)	(2.383)	(0.222)	(2.266)	(0.117)	(0.216)	(2.383)	(0.117)
Male teacher	0.00279	0.506	0.00327	0.505	0.00327	0.506	-0.000478	0.00279	0.505	0.000478
	(0.0855)	(3.211)	(0.113)	(3.215)	(0.113)	(3.211)	(0.0287)	(0.0855)	(3.215)	(0.0287)
T. Experience	-0.172	0.413	-0.159	0.400	-0.159	0.413	-0.0130	-0.172	0.400	0.0130
	(0.189)	(3.068)	(0.214)	(2.967)	(0.214)	(3.068)	(0.109)	(0.189)	(2.967)	(0.109)
T. Certificate!	-0.00881	-2.106	-0.0271	-2.088	-0.0271	-2.106	0.0183	-0.00881	-2.088	-0.0183
	(0.0469)	(4.658)	(0.0435)	(4.627)	(0.0435)	(4.658)	(0.0538)	(0.0469)	(4.627)	(0.0538)
M SCL RCS	-0.00634	-0.229	-0.00529	-0.230	-0.00529	-0.229	-0.00105	-0.00634	-0.230	0.00105
	(0.0340)	(5.393)	(0.0338)	(5.417)	(0.0338)	(5.393)	(0.0272)	(0.0340)	(5.417)	(0.0272)
L SCL RSC	0.0532	-0.958	-1.20e-05	-0.905	-1.20e-05	-0.958	0.0532	0.0532	-0.905	-0.0532
	(0.0990)	(1.816)	(0.102)	(1.716)	(0.102)	(1.816)	(0.110)	(0.0990)	(1.716)	(0.110)
T. UNI Degree	0.0363	-2.456	0.0219	-2.442	0.0219	-2.456	0.0145	0.0363	-2.442	-0.0145
	(0.109)	(14.03)	(0.0489)	(13.95)	(0.0489)	(14.03)	(0.108)	(0.109)	(13.95)	(0.108)
COMMU.>50000	0.00634	0.156	-0.00175	0.164	-0.00175	0.156	0.00810	0.00634	0.164	-0.00810
	(0.0535)	(1.126)	(0.0583)	(1.188)	(0.0583)	(1.126)	(0.0703)	(0.0535)	(1.188)	(0.0703)
Disadv	-0.0586	0.193	-0.0614	0.196	-0.0614	0.193	0.00281	-0.0586	0.196	-0.00281
	(0.129)	(2.464)	(0.133)	(2.502)	(0.133)	(2.464)	(0.0395)	(0.129)	(2.502)	(0.0395)
Class size	0.875	-41.35	0.635	-41.11	0.635	-41.35	0.240	0.875	-41.11	-0.240
	(1.279)	(42.95)	(1.229)	(42.70)	(1.229)	(42.95)	(0.254)	(1.279)	(42.70)	(0.254)
Class size sq	-1.442	25.41	-1.111	25.08	-1.111	25.41	-0.331	-1.442	25.08	0.331
	(1.283)	(26.39)	(1.202)	(26.04)	(1.202)	(26.39)	(0.352)	(1.283)	(26.04)	(0.352)
Constant		44.01*		44.01*			44.01*			44.01*
		(22.78)		(22.78)			(22.78)			(22.78)
Total (char/coef)	-1.789	22.77***	-1.509	22.49***	-1.509	22.77***	-0.280	-1.789	22.49***	0.280
	(1.286)	(2.034)	(1.344)	(2.178)	(1.344)	(2.034)	(0.721)	(1.286)	(2.178)	(0.721)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	431.3	410.4	20.98***				431.3	410.4	20.98***	
	(2.655)	(2.769)	(2.408)				(2.655)	(2.769)	(2.408)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (only Tunisia have 2 classes chosen from each school)

Table A-5.5: Turkey Mean decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	-0.0552	-5.618	-0.212	-5.461	-0.212	-5.618	0.157	-0.0552	-5.461	-0.157
	(0.102)	(5.072)	(0.180)	(4.933)	(0.180)	(5.072)	(0.198)	(0.102)	(4.933)	(0.198)
Upper-sec	-0.886*	-0.156	-0.907**	-0.135	-0.907**	-0.156	0.0206	-0.886*	-0.135	-0.0206
	(0.497)	(2.526)	(0.450)	(2.180)	(0.450)	(2.526)	(0.347)	(0.497)	(2.180)	(0.347)
Post-sec not UNI	0.0396	-0.433	0.0523	-0.446	0.0523	-0.433	-0.0126	0.0396	-0.446	0.0126
	(0.246)	(0.595)	(0.298)	(0.617)	(0.298)	(0.595)	(0.0615)	(0.246)	(0.617)	(0.0615)
University degree	-0.360	-0.556	-0.392	-0.524	-0.392	-0.556	0.0324	-0.360	-0.524	-0.0324
	(0.638)	(1.270)	(0.656)	(1.201)	(0.656)	(1.270)	(0.0746)	(0.638)	(1.201)	(0.0746)
Native parents	-0.538*	36.44*	-0.187	36.09	-0.187	36.44*	-0.351	-0.538*	36.09	0.351
	(0.291)	(22.15)	(0.199)	(21.95)	(0.199)	(22.15)	(0.263)	(0.291)	(21.95)	(0.263)
One bookcases	-0.836**	0.772	-0.736**	0.672	-0.736**	0.772	-0.100	-0.836**	0.672	0.100
	(0.426)	(1.762)	(0.331)	(1.528)	(0.331)	(1.762)	(0.246)	(0.426)	(1.528)	(0.246)
Two bookcases	-1.911***	3.214**	-0.907**	2.210**	-0.907**	3.214**	-1.004**	-1.911***	2.210**	1.004**
	(0.451)	(1.520)	(0.437)	(1.087)	(0.437)	(1.520)	(0.470)	(0.451)	(1.087)	(0.470)
Home possess H	0.446	-6.099	0.884	-6.537	0.884	-6.099	-0.438	0.446	-6.537	0.438
	(0.517)	(4.096)	(0.830)	(4.432)	(0.830)	(4.096)	(0.441)	(0.517)	(4.432)	(0.441)
Home possess M	-0.468	-3.592	-0.670	-3.390	-0.670	-3.592	0.202	-0.468	-3.390	-0.202
	(0.466)	(6.324)	(0.549)	(5.962)	(0.549)	(6.324)	(0.365)	(0.466)	(5.962)	(0.365)
TL spoken Als	-1.757***	-12.60*	-2.971***	-11.39*	-2.971***	-12.60*	1.214	-1.757***	-11.39*	-1.214
	(0.519)	(7.300)	(0.773)	(6.553)	(0.773)	(7.300)	(0.790)	(0.519)	(6.553)	(0.790)
PC at H&SCL	-0.00600	0.204	-0.00585	0.204	-0.00585	0.204	-0.000146	-0.00600	0.204	0.000146
	(0.409)	(3.322)	(0.500)	(3.340)	(0.500)	(3.322)	(0.0930)	(0.409)	(3.340)	(0.0930)
PC at H/SCL	-0.778*	0.0792	-0.770	0.0719	-0.770	0.0792	-0.00738	-0.778*	0.0719	0.00738
	(0.455)	(6.574)	(0.623)	(5.970)	(0.623)	(6.574)	(0.612)	(0.455)	(5.970)	(0.612)
Male teacher	-0.137	-2.356	-0.217	-2.276	-0.217	-2.356	0.0807	-0.137	-2.276	-0.0807
	(0.193)	(4.227)	(0.294)	(4.069)	(0.294)	(4.227)	(0.182)	(0.193)	(4.069)	(0.182)
T. Experience	-0.153	-2.814	-0.222	-2.745	-0.222	-2.814	0.0690	-0.153	-2.745	-0.0690
	(0.286)	(7.976)	(0.366)	(7.772)	(0.366)	(7.976)	(0.206)	(0.286)	(7.772)	(0.206)
T. Certificate!	-0.0216	-17.18	-0.0422	-17.16	-0.0422	-17.18	0.0206	-0.0216	-17.16	-0.0206
	(0.0218)	(26.56)	(0.0473)	(26.53)	(0.0473)	(26.56)	(0.0322)	(0.0218)	(26.53)	(0.0322)
M SCL RCS	0.0225	-1.908	0.0201	-1.905	0.0201	-1.908	0.00237	0.0225	-1.905	-0.00237
	(0.374)	(9.797)	(0.368)	(9.769)	(0.368)	(9.797)	(0.0360)	(0.374)	(9.769)	(0.0360)
L SCL RSC	-0.230	0.0990	-0.233	0.102	-0.233	0.0990	0.00273	-0.230	0.102	-0.00273
	(0.468)	(3.680)	(0.475)	(3.773)	(0.475)	(3.680)	(0.0962)	(0.468)	(3.773)	(0.0962)
T. UNI Degree	0.0133	-9.604	0.325	-9.915	0.325	-9.604	-0.312	0.0133	-9.915	0.312
	(0.316)	(10.91)	(0.512)	(11.26)	(0.512)	(10.91)	(0.373)	(0.316)	(11.26)	(0.373)
COMMU.>50000	-0.00838	5.253	-0.00509	5.250	-0.00509	5.253	-0.00330	-0.00838	5.250	0.00330
	(0.375)	(5.352)	(0.236)	(5.353)	(0.236)	(5.352)	(0.140)	(0.375)	(5.353)	(0.140)
Disadv	-0.897*	0.149	-0.904*	0.156	-0.904*	0.149	0.00658	-0.897*	0.156	-0.00658
	(0.478)	(5.610)	(0.487)	(5.860)	(0.487)	(5.610)	(0.252)	(0.478)	(5.860)	(0.252)
Class size	0.295	-47.86	-0.223	-47.34	-0.223	-47.86	0.519	0.295	-47.34	-0.519
	(0.667)	(50.67)	(0.714)	(50.00)	(0.714)	(50.67)	(0.952)	(0.667)	(50.00)	(0.952)
Class size sq	-0.189	27.37	0.376	26.81	0.376	27.37	-0.565	-0.189	26.81	0.565
	(0.551)	(23.65)	(0.688)	(23.01)	(0.688)	(23.65)	(0.887)	(0.551)	(23.01)	(0.887)
Constant		48.26		48.26			48.26			48.26
		(46.50)		(46.50)			(46.50)			(46.50)
Total (char/coef)	-8.694***	8.151**	-8.573***	8.030**	-8.573***	8.151**	-0.121	-8.694***	8.030**	0.121
	(1.985)	(3.638)	(2.269)	(3.613)	(2.269)	(3.638)	(1.470)	(1.985)	(3.613)	(1.470)
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap	Boys	Girls	Total Gap
	431.6	432.1	-0.543		431.6	432.1	-0.543	431.6	432.1	-0.543
	(4.995)	(5.288)	(3.888)		(4.995)	(5.288)	(3.888)	(4.995)	(5.288)	(3.888)

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A-5.6: Iran Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	0.0151	-1.872	-0.0391	-1.818	-0.0391	-1.872	0.0541	0.0151	-1.818	-0.0541
	(0.0952)	(2.430)	(0.138)	(2.373)	(0.138)	(2.430)	(0.216)	(0.0952)	(2.373)	(0.216)
Upper-sec	-0.707*	1.538	-0.387	1.217	-0.387	1.538	-0.321	-0.707*	1.217	0.321
	(0.402)	(1.884)	(0.394)	(1.506)	(0.394)	(1.884)	(0.386)	(0.402)	(1.506)	(0.386)
Post-sec not UNI	0.310	0.491	0.222	0.578	0.222	0.491	0.0876	0.310	0.578	-0.0876
	(0.370)	(1.279)	(0.381)	(1.490)	(0.381)	(1.279)	(0.219)	(0.370)	(1.490)	(0.219)
University degree	-0.216	0.191	-0.204	0.179	-0.204	0.191	-0.0119	-0.216	0.179	0.0119
	(0.560)	(1.477)	(0.712)	(1.352)	(0.712)	(1.477)	(0.178)	(0.560)	(1.352)	(0.178)
Native parents	-0.421	31.20*	-0.00535	30.78*	-0.00535	31.20*	-0.416	-0.421	30.78*	0.416
	(0.287)	(17.49)	(0.230)	(17.30)	(0.230)	(17.49)	(0.323)	(0.287)	(17.30)	(0.323)
One bookcases	0.0856	0.436	0.0750	0.446	0.0750	0.436	0.0106	0.0856	0.446	-0.0106
	(0.514)	(1.335)	(0.402)	(1.375)	(0.402)	(1.335)	(0.119)	(0.514)	(1.375)	(0.119)
Two bookcases	-0.100	-1.639	-0.428	-1.312	-0.428	-1.639	0.328	-0.100	-1.312	-0.328
	(0.284)	(1.454)	(0.316)	(1.184)	(0.316)	(1.454)	(0.343)	(0.284)	(1.184)	(0.343)
Home possess H	0.0855	4.102	0.0138	4.174	0.0138	4.102	0.0717	0.0855	4.174	-0.0717
	(0.845)	(3.440)	(0.0519)	(3.576)	(0.0519)	(3.440)	(0.842)	(0.845)	(3.576)	(0.842)
Home possess M	-0.406	4.652	-0.0991	4.345	-0.0991	4.652	-0.307	-0.406	4.345	0.307
	(0.468)	(2.981)	(0.213)	(2.803)	(0.213)	(2.981)	(0.373)	(0.468)	(2.803)	(0.373)
TL spoken Als	-1.160	-2.786	-1.619*	-2.327	-1.619*	-2.786	0.459	-1.160	-2.327	-0.459
	(1.088)	(5.776)	(0.920)	(4.816)	(0.920)	(5.776)	(0.963)	(1.088)	(4.816)	(0.963)
PC at H&SCL	-0.595	-0.571	-0.718	-0.448	-0.718	-0.571	0.123	-0.595	-0.448	-0.123
	(1.320)	(1.704)	(1.389)	(1.552)	(1.389)	(1.704)	(0.283)	(1.320)	(1.552)	(0.283)
PC at H/SCL	0.169	-2.486	0.312	-2.629	0.312	-2.486	-0.143	0.169	-2.629	0.143
	(0.409)	(2.770)	(0.695)	(2.922)	(0.695)	(2.770)	(0.334)	(0.409)	(2.922)	(0.334)
Male teacher	5.929	4.009	-22.03**	31.96	-22.03**	4.009	27.95	5.929	31.96	-27.95
	(41.69)	(5.962)	(10.76)	(49.40)	(10.76)	(5.962)	(43.52)	(41.69)	(49.40)	(43.52)
T. Experience	0.226	-8.838	1.268	-9.881	1.268	-8.838	-1.043	0.226	-9.881	1.043
	(0.765)	(10.30)	(1.468)	(11.41)	(1.468)	(10.30)	(1.573)	(0.765)	(11.41)	(1.573)
M SCL RCS	-0.423	-13.39	-0.112	-13.70	-0.112	-13.39	-0.311	-0.423	-13.70	0.311
	(1.907)	(12.19)	(0.464)	(12.43)	(0.464)	(12.19)	(1.536)	(1.907)	(12.43)	(1.536)
L SCL RSC	0.0639	-5.684	0.0125	-5.632	0.0125	-5.684	0.0514	0.0639	-5.632	-0.0514
	(2.232)	(3.816)	(0.283)	(3.709)	(0.283)	(3.816)	(1.962)	(2.232)	(3.709)	(1.962)
T. UNI Degree	-0.489	2.073	-0.157	1.741	-0.157	2.073	-0.333	-0.489	1.741	0.333
	(0.806)	(5.609)	(0.540)	(4.684)	(0.540)	(5.609)	(0.947)	(0.806)	(4.684)	(0.947)
COMMU.>50000	0.165	-1.953	0.210	-1.998	0.210	-1.953	-0.0450	0.165	-1.998	0.0450
	(1.055)	(6.884)	(0.983)	(7.021)	(0.983)	(6.884)	(0.205)	(1.055)	(7.021)	(0.205)
Disadv	-1.472	-3.726	-0.388	-4.810	-0.388	-3.726	-1.084	-1.472	-4.810	1.084
	(1.399)	(4.871)	(0.920)	(6.313)	(0.920)	(4.871)	(1.556)	(1.399)	(6.313)	(1.556)
Class size	3.607	202.1*	-6.568	212.3*	-6.568	202.1*	10.17	3.607	212.3*	-10.17
	(5.263)	(118.6)	(6.730)	(125.4)	(6.730)	(118.6)	(10.00)	(5.263)	(125.4)	(10.00)
Class size sq	-2.269	-100.6	5.304	-108.2	5.304	-100.6	-7.573	-2.269	-108.2	7.573
	(4.031)	(63.05)	(6.899)	(68.01)	(6.899)	(63.05)	(9.057)	(4.031)	(68.01)	(9.057)
Constant		-115.5		-115.5			-115.5			-115.5
		(75.74)		(75.74)			(75.74)			(75.74)
Total (char/coef)	-0.394	-6.592	-24.43*	17.44	-24.43*	-6.592	24.04	-0.394	17.44	-24.04
	(41.53)	(42.14)	(12.96)	(11.66)	(12.96)	(42.14)	(43.56)	(41.53)	(11.66)	(43.56)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	400.2	407.2	-6.987				400.2	407.2	-6.987	
	(6.090)	(5.295)	(8.059)				(6.090)	(5.295)	(8.059)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (teaching certificate (licence) not included for Iran)

Table A-5.7: Jordan Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	0.0258	0.555	0.116	0.465	0.116	0.555	-0.0904	0.0258	0.465	0.0904
	(0.178)	(1.229)	(0.200)	(1.029)	(0.200)	(1.229)	(0.214)	(0.178)	(1.029)	(0.214)
Upper-sec	-0.908*	3.171	-0.307	2.570	-0.307	3.171	-0.601	-0.908*	2.570	0.601
	(0.547)	(3.708)	(0.511)	(3.020)	(0.511)	(3.708)	(0.708)	(0.547)	(3.020)	(0.708)
Post-sec not UNI	-1.630*	2.009	-1.250*	1.629	-1.250*	2.009	-0.380	-1.630*	1.629	0.380
	(0.867)	(2.966)	(0.646)	(2.381)	(0.646)	(2.966)	(0.597)	(0.867)	(2.381)	(0.597)
University degree	1.979**	1.027	1.763**	1.243	1.763**	1.027	0.216	1.979**	1.243	-0.216
	(0.860)	(3.245)	(0.833)	(3.911)	(0.833)	(3.245)	(0.670)	(0.860)	(3.911)	(0.670)
Native parents	0.216	-9.463**	-0.0571	-9.189**	-0.0571	-9.463**	0.273	0.216	-9.189**	-0.273
	(0.283)	(4.635)	(0.191)	(4.450)	(0.191)	(4.635)	(0.443)	(0.283)	(4.450)	(0.443)
One bookcases	-0.642**	3.831	-0.240	3.428	-0.240	3.831	-0.403	-0.642**	3.428	0.403
	(0.313)	(2.443)	(0.202)	(2.241)	(0.202)	(2.443)	(0.261)	(0.313)	(2.241)	(0.261)
Two bookcases	0.0728	1.492	0.0471	1.518	0.0471	1.492	0.0257	0.0728	1.518	-0.0257
	(0.336)	(1.767)	(0.243)	(1.785)	(0.243)	(1.767)	(0.103)	(0.336)	(1.785)	(0.103)
Home possess H	0.170	-2.450	0.185	-2.466	0.185	-2.450	-0.0157	0.170	-2.466	0.0157
	(1.898)	(6.560)	(2.057)	(6.565)	(2.057)	(6.560)	(0.178)	(1.898)	(6.565)	(0.178)
Home possess M	-2.279*	-1.649	-2.461**	-1.466	-2.461**	-1.649	0.183	-2.279*	-1.466	-0.183
	(1.215)	(5.566)	(1.196)	(5.008)	(1.196)	(5.566)	(0.586)	(1.215)	(5.008)	(0.586)
TL spoken Als	-0.677	-6.743	-0.302	-7.118	-0.302	-6.743	-0.374	-0.677	-7.118	0.374
	(0.559)	(7.285)	(0.345)	(7.597)	(0.345)	(7.285)	(0.429)	(0.559)	(7.597)	(0.429)
PC at H&SCL	-0.0827	0.462	-0.0604	0.439	-0.0604	0.462	-0.0223	-0.0827	0.439	0.0223
	(0.267)	(6.383)	(0.214)	(6.078)	(0.214)	(6.383)	(0.309)	(0.267)	(6.078)	(0.309)
PC at H/SCL	-0.0797	-2.477	-0.0575	-2.500	-0.0575	-2.477	-0.0222	-0.0797	-2.500	0.0222
	(0.806)	(4.902)	(0.569)	(4.951)	(0.569)	(4.902)	(0.245)	(0.806)	(4.951)	(0.245)
Male teacher	16.49	0.795**	-27.92	45.20*	-27.92	0.795**	44.41*	16.49	45.20*	-44.41*
	(21.18)	(0.405)	(21.77)	(24.54)	(21.77)	(0.405)	(24.18)	(21.18)	(24.54)	(24.18)
T. Experience	-0.0630	-13.27	0.217	-13.55	0.217	-13.27	-0.280	-0.0630	-13.55	0.280
	(0.652)	(9.792)	(1.552)	(10.26)	(1.552)	(9.792)	(2.166)	(0.652)	(10.26)	(2.166)
T. Certificate!	0.00101	0.314	-0.0156	0.331	-0.0156	0.314	0.0166	0.00101	0.331	-0.0166
	(0.793)	(14.08)	(0.436)	(14.91)	(0.436)	(14.08)	(0.880)	(0.793)	(14.91)	(0.880)
M SCL RCS	0.124	-18.57	-0.0268	-18.42	-0.0268	-18.57	0.151	0.124	-18.42	-0.151
	(1.369)	(14.51)	(0.330)	(14.07)	(0.330)	(14.51)	(1.591)	(1.369)	(14.07)	(1.591)
L SCL RSC	-0.0213	-6.194**	0.0208	-6.236**	0.0208	-6.194**	-0.0421	-0.0213	-6.236**	0.0421
	(1.437)	(2.915)	(1.390)	(3.168)	(1.390)	(2.915)	(2.816)	(1.437)	(3.168)	(2.816)
T. UNI Degree	-1.356	40.25	0.676	38.22	0.676	40.25	-2.032	-1.356	38.22	2.032
	(1.552)	(30.99)	(1.721)	(29.35)	(1.721)	(30.99)	(2.736)	(1.552)	(29.35)	(2.736)
COMMU.>50000	1.705	-3.824	2.430	-4.549	2.430	-3.824	-0.725	1.705	-4.549	0.725
	(1.728)	(7.098)	(2.298)	(8.320)	(2.298)	(7.098)	(1.501)	(1.728)	(8.320)	(1.501)
Disadv	1.426	0.277	1.483	0.220	1.483	0.277	-0.0574	1.426	0.220	0.0574
	(1.828)	(7.964)	(1.619)	(6.360)	(1.619)	(7.964)	(1.617)	(1.828)	(6.360)	(1.617)
Class size	0.770	53.95	2.573	52.14	2.573	53.95	-1.803	0.770	52.14	1.803
	(3.678)	(169.1)	(4.701)	(163.9)	(4.701)	(169.1)	(6.156)	(3.678)	(163.9)	(6.156)
Class size sq	1.635	-54.63	-2.038	-50.96	-2.038	-54.63	3.672	1.635	-50.96	-3.672
	(4.686)	(84.37)	(3.927)	(78.90)	(3.927)	(84.37)	(7.096)	(4.686)	(78.90)	(7.096)
Constant		48.26		48.26			48.26			48.26
		(46.50)		(46.50)			(46.50)			(46.50)
Total (char/coef)	11.91	-32.38	-28.92	8.455	-28.92	-32.38	40.83*	11.91	8.455	-40.83*
	(23.46)	(23.79)	(21.79)	(20.41)	(21.79)	(23.79)	(23.57)	(23.46)	(20.41)	(23.57)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	417.1***	437.6***	-20.47**				417.1***	437.6***	-20.47**	
	(5.626)	(6.420)	(8.832)				(5.626)	(6.420)	(8.832)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A-5.8: Saudi Arabia Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	0.168	-3.361**	-0.151	-3.042**	-0.151	-3.361**	0.319	0.168	-3.042**	-0.319
	(0.206)	(1.690)	(0.157)	(1.546)	(0.157)	(1.690)	(0.322)	(0.206)	(1.546)	(0.322)
Upper-sec	0.197	-3.019	-0.126	-2.697	-0.126	-3.019	0.323	0.197	-2.697	-0.323
	(0.204)	(2.012)	(0.191)	(1.776)	(0.191)	(2.012)	(0.347)	(0.204)	(1.776)	(0.347)
Post-sec not UNI	-0.177	0.227	-0.133	0.183	-0.133	0.227	-0.0440	-0.177	0.183	0.0440
	(0.176)	(0.731)	(0.184)	(0.583)	(0.184)	(0.731)	(0.151)	(0.176)	(0.583)	(0.151)
University degree	-0.111	-4.538	-0.279	-4.370	-0.279	-4.538	0.168	-0.111	-4.370	-0.168
	(0.275)	(3.321)	(0.506)	(3.228)	(0.506)	(3.321)	(0.266)	(0.275)	(3.228)	(0.266)
Native parents	0.552	-0.385	0.527	-0.360	0.527	-0.385	0.0252	0.552	-0.360	-0.0252
	(0.392)	(6.746)	(0.364)	(6.321)	(0.364)	(6.746)	(0.449)	(0.392)	(6.321)	(0.449)
One bookcases	-1.802**	3.074	-0.833	2.105	-0.833	3.074	-0.969	-1.802**	2.105	0.969
	(0.818)	(2.894)	(0.640)	(1.988)	(0.640)	(2.894)	(0.931)	(0.818)	(1.988)	(0.931)
Two bookcases	-0.405	-0.380	-0.515	-0.270	-0.515	-0.380	0.111	-0.405	-0.270	-0.111
	(0.433)	(1.815)	(0.338)	(1.277)	(0.338)	(1.815)	(0.539)	(0.433)	(1.277)	(0.539)
Home possess H	-6.764***	12.00*	-3.954***	9.189*	-3.954***	12.00*	-2.810*	-6.764***	9.189*	2.810*
	(1.649)	(6.303)	(1.408)	(4.903)	(1.408)	(6.303)	(1.605)	(1.649)	(4.903)	(1.605)
Home possess M	0.455	7.009	0.184	7.280	0.184	7.009	0.270	0.455	7.280	-0.270
	(0.639)	(5.096)	(0.261)	(5.305)	(0.261)	(5.096)	(0.459)	(0.639)	(5.305)	(0.459)
TL spoken Als	-0.787	-1.788	-0.374	-2.202	-0.374	-1.788	-0.413	-0.787	-2.202	0.413
	(0.743)	(4.000)	(0.505)	(4.893)	(0.505)	(4.000)	(0.926)	(0.743)	(4.893)	(0.926)
PC at H&SCL	-3.132**	-0.637	-1.967	-1.802	-1.967	-0.637	-1.165	-3.132**	-1.802	1.165
	(1.403)	(1.030)	(1.648)	(2.940)	(1.648)	(1.030)	(1.930)	(1.403)	(2.940)	(1.930)
PC at H/SCL	2.064**	-2.693	1.492**	-2.121	1.492**	-2.693	0.573	2.064**	-2.121	-0.573
	(0.924)	(4.779)	(0.695)	(3.742)	(0.695)	(4.779)	(1.054)	(0.924)	(3.742)	(1.054)
Male teacher	14.71	0.124	-39.66	54.49*	-39.66	0.124	54.36*	14.71	54.49*	-54.36*
	(14.05)	(0.0781)	(24.93)	(30.31)	(24.93)	(0.0781)	(30.24)	(14.05)	(30.31)	(30.24)
T. Experience	0.0451	-7.401	2.219	-9.575	2.219	-7.401	-2.174	0.0451	-9.575	2.174
	(1.013)	(6.804)	(2.697)	(9.129)	(2.697)	(6.804)	(2.881)	(1.013)	(9.129)	(2.881)
M SCL RCS	-0.0642	25.53*	1.133	24.34*	1.133	25.53*	-1.197	-0.0642	24.34*	1.197
	(0.452)	(13.34)	(2.862)	(12.52)	(2.862)	(13.34)	(3.019)	(0.452)	(12.52)	(3.019)
L SCL RSC	0.784	3.198	2.004	1.978	2.004	3.198	-1.220	0.784	1.978	1.220
	(1.521)	(4.059)	(2.031)	(2.536)	(2.031)	(4.059)	(1.990)	(1.521)	(2.536)	(1.990)
T. UNI Degree	-0.206	12.58	-0.608	12.98	-0.608	12.58	0.402	-0.206	12.98	-0.402
	(0.884)	(24.92)	(1.217)	(25.97)	(1.217)	(24.92)	(1.486)	(0.884)	(25.97)	(1.486)
COMMU.>50000	-0.392	0.193	-0.381	0.182	-0.381	0.193	-0.0109	-0.392	0.182	0.0109
	(1.368)	(4.407)	(1.050)	(4.123)	(1.050)	(4.407)	(0.436)	(1.368)	(4.123)	(0.436)
Disadv	0.271	-2.156	0.00708	-1.891	0.00708	-2.156	0.264	0.271	-1.891	-0.264
	(0.832)	(2.209)	(0.106)	(1.977)	(0.106)	(2.209)	(0.824)	(0.832)	(1.977)	(0.824)
Class size	-1.127	45.12	0.887	43.11	0.887	45.12	-2.014	-1.127	43.11	2.014
	(3.096)	(48.51)	(1.385)	(46.18)	(1.385)	(48.51)	(3.910)	(3.096)	(46.18)	(3.910)
Class size sq	5.873	-28.35	-1.969	-20.51	-1.969	-28.35	7.842	5.873	-20.51	-7.842
	(7.615)	(26.66)	(2.715)	(19.15)	(2.715)	(26.66)	(8.226)	(7.615)	(19.15)	(8.226)
Constant		-94.56**		-94.56**			-94.56**			-94.56**
		(40.45)		(40.45)			(40.45)			(40.45)
Total (char/coef)	11.86	-34.69**	-43.88*	21.05	-43.88*	-34.69**	55.74*	11.86	21.05	21.05
	(14.36)	(14.66)	(25.02)	(25.59)	(25.02)	(14.66)	(30.69)	(14.36)	(25.59)	(25.59)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	318.5***	341.4***	-22.83***				318.5***	341.4***	-22.83***	
	(3.981)	(3.614)	(5.008)				(3.981)	(3.614)	(5.008)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (teaching certificate (licence) not included for Saudi Arabia)

Table A-5.9: Egypt Mean Decomposition

VARIABLES	Two fold decomposition Boys are reference group		Two fold decomposition Girls are reference group		Three fold decomposition Girls are reference group			Three fold decomposition Boys are reference group		
	Char.	Coef.	Char.	Coef.	Char.	Coef.	Interactions	Char.	Coef.	Interactions
Lower-sec EDC	-0.319	1.008	-0.204	0.892	-0.204	1.008	-0.116	-0.319	0.892	0.116
	(0.308)	(3.220)	(0.258)	(2.863)	(0.258)	(3.220)	(0.387)	(0.308)	(2.863)	(0.387)
Upper-sec	-0.653	2.609	-0.294	2.251	-0.294	2.609	-0.358	-0.653	2.251	0.358
	(0.447)	(1.835)	(0.219)	(1.591)	(0.219)	(1.835)	(0.379)	(0.447)	(1.591)	(0.379)
Post-sec not UNI	0.0173	1.042	0.0147	1.045	0.0147	1.042	0.00266	0.0173	1.045	-0.00266
	(0.736)	(2.166)	(0.479)	(2.201)	(0.479)	(2.166)	(0.258)	(0.736)	(2.201)	(0.258)
University degree	0.236	0.897	0.0172	1.115	0.0172	0.897	0.218	0.236	1.115	-0.218
	(0.287)	(1.712)	(0.332)	(2.136)	(0.332)	(1.712)	(0.452)	(0.287)	(2.136)	(0.452)
Native parents	-1.745	15.01**	-1.162	14.42**	-1.162	15.01**	-0.584	-1.745	14.42**	0.584
	(1.604)	(6.785)	(1.013)	(6.502)	(1.013)	(6.785)	(0.671)	(1.604)	(6.502)	(0.671)
One bookcases	-0.323	2.214	-0.122	2.012	-0.122	2.214	-0.202	-0.323	2.012	0.202
	(0.204)	(1.951)	(0.142)	(1.769)	(0.142)	(1.951)	(0.188)	(0.204)	(1.769)	(0.188)
Two bookcases	0.0228	0.510	-0.0105	0.544	-0.0105	0.510	0.0333	0.0228	0.544	-0.0333
	(0.0582)	(1.126)	(0.0624)	(1.204)	(0.0624)	(1.126)	(0.0849)	(0.0582)	(1.204)	(0.0849)
Home possess H	0.658	-2.694	0.787	-2.824	0.787	-2.694	-0.130	0.658	-2.824	0.130
	(1.615)	(2.468)	(1.939)	(2.558)	(1.939)	(2.468)	(0.347)	(1.615)	(2.558)	(0.347)
Home possess M	-1.104	-6.111	-1.504	-5.710	-1.504	-6.111	0.401	-1.104	-5.710	-0.401
	(0.788)	(4.390)	(1.010)	(4.152)	(1.010)	(4.390)	(0.364)	(0.788)	(4.152)	(0.364)
TL spoken Als	-0.443	10.45**	-1.021	11.03**	-1.021	10.45**	0.578	-0.443	11.03**	-0.578
	(0.404)	(4.575)	(0.738)	(4.808)	(0.738)	(4.575)	(0.444)	(0.404)	(4.808)	(0.444)
PC at H&SCL	-1.382**	0.275	-1.461**	0.354	-1.461**	0.275	0.0794	-1.382**	0.354	-0.0794
	(0.627)	(2.216)	(0.614)	(2.819)	(0.614)	(2.216)	(0.613)	(0.627)	(2.819)	(0.613)
PC at H/SCL	2.503***	0.396	2.571***	0.328	2.571***	0.396	-0.0674	2.503***	0.328	0.0674
	(0.788)	(5.741)	(0.835)	(4.765)	(0.835)	(5.741)	(0.979)	(0.788)	(4.765)	(0.979)
Male teacher	0.890	4.835	-0.174	5.899	-0.174	4.835	1.065	0.890	5.899	-1.065
	(1.525)	(6.424)	(1.134)	(7.865)	(1.134)	(6.424)	(1.481)	(1.525)	(7.865)	(1.481)
T. Experience	-0.652	2.184	-0.546	2.078	-0.546	2.184	-0.106	-0.652	2.078	0.106
	(1.124)	(8.418)	(1.048)	(8.027)	(1.048)	(8.418)	(0.401)	(1.124)	(8.027)	(0.401)
T. Certificate!	0.0710	4.954	0.0185	5.006	0.0185	4.954	0.0525	0.0710	5.006	-0.0525
	(0.379)	(7.664)	(0.158)	(7.766)	(0.158)	(7.664)	(0.279)	(0.379)	(7.766)	(0.279)
M SCL RCS	0.394	-13.64*	-0.224	-13.02*	-0.224	-13.64*	0.618	0.394	-13.02*	-0.618
	(0.808)	(7.704)	(0.568)	(7.213)	(0.568)	(7.704)	(1.283)	(0.808)	(7.213)	(1.283)
L SCL RSC	-0.0625	0.862	-0.139	0.939	-0.139	0.862	0.0766	-0.0625	0.939	-0.0766
	(0.529)	(1.130)	(0.939)	(1.430)	(0.939)	(1.130)	(0.494)	(0.529)	(1.430)	(0.494)
T. UNI Degree	3.279	22.87	0.798	25.35	0.798	22.87	2.482	3.279	25.35	-2.482
	(20.79)	(191.6)	(1.742)	(212.3)	(1.742)	(191.6)	(20.78)	(20.79)	(212.3)	(20.78)
COMMU.>50000	0.758	0.729	0.646	0.842	0.646	0.729	0.112	0.758	0.842	-0.112
	(0.817)	(4.289)	(0.755)	(4.973)	(0.755)	(4.289)	(0.687)	(0.817)	(4.973)	(0.687)
Disadv.	0.0456	10.18	0.637	9.590	0.637	10.18	-0.592	0.0456	9.590	0.592
	(0.272)	(6.347)	(1.493)	(6.049)	(1.493)	(6.347)	(1.342)	(0.272)	(6.049)	(1.342)
Class size	-0.259	65.30	1.999	63.04	1.999	65.30	-2.258	-0.259	63.04	2.258
	(2.715)	(153.4)	(4.880)	(148.0)	(4.880)	(153.4)	(5.383)	(2.715)	(148.0)	(5.383)
Class size sq	1.279	-47.12	-1.522	-44.32	-1.522	-47.12	2.800	1.279	-44.32	-2.800
	(2.979)	(85.69)	(4.263)	(80.57)	(4.263)	(85.69)	(5.299)	(2.979)	(80.57)	(5.299)
Constant		-100.4		-100.4			-100.4			-100.4
		(234.0)		(234.0)			(234.0)			(234.0)
Total (char/coef)	-0.403	-12.87	-1.920	-11.35**	-1.920	-12.87	1.517	-0.403	-11.35**	-1.517
	(12.55)	(14.49)	(3.927)	(5.581)	(3.927)	(14.49)	(12.16)	(12.55)	(5.581)	(12.16)
Raw Gap	Boys	Girls	Total Gap				Boys	Girls	Total Gap	
	384.0	397.3	-13.27**				384.0	397.3	-13.27**	
	(4.587)	(4.995)	(6.445)				(4.587)	(4.995)	(6.445)	

Jackknife Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix B-4: Quantile Decompositions

Table B-5.1: Algeria detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.00236	0.989	-0.000343	0.696	0.00626	-1.107	-0.000909	-1.467	0.00762	-0.994	-0.00111	-0.931
	(0.104)	(3.053)	(0.0123)	(2.931)	(0.0615)	(1.866)	(0.00722)	(1.871)	(0.148)	(2.140)	(0.0178)	(2.219)
Upper-sec	-0.251	1.761	-0.256	1.514	-0.117	-0.0496	-0.119	-0.395	-0.144	-0.123	-0.147	-0.244
	(0.267)	(2.473)	(0.273)	(2.682)	(0.235)	(2.402)	(0.234)	(2.361)	(0.342)	(2.604)	(0.339)	(2.448)
Post-sec not UNI	-0.151	0.667	-0.154	0.573	-0.0630	-0.623	-0.0641	-0.661	-0.246	0.262	-0.250	0.429
	(0.224)	(1.937)	(0.227)	(1.834)	(0.139)	(1.184)	(0.140)	(1.173)	(0.279)	(1.835)	(0.256)	(1.750)
University degree	0.0432	0.934	0.0450	0.608	0.0716	0.731	0.0746	0.603	0.0944	0.373	0.0983	0.345
	(0.245)	(1.823)	(0.241)	(1.825)	(0.113)	(1.125)	(0.114)	(1.140)	(0.191)	(1.759)	(0.200)	(1.818)
One bookcases	-0.464	0.398	-0.454	0.358	-0.711**	1.236	-0.696***	1.168	-1.185**	2.937	-1.159***	2.754
	(0.348)	(1.803)	(0.306)	(1.757)	(0.330)	(1.261)	(0.265)	(1.312)	(0.566)	(2.465)	(0.443)	(2.689)
Two bookcases	0.00147	0.197	0.00140	0.17	-0.0173	-0.182	-0.0165	-0.317	-0.0774	-0.102	-0.0740	0.0618
	(0.117)	(1.133)	(0.0874)	(1.131)	(0.0582)	(0.760)	(0.0525)	(0.775)	(0.0920)	(0.996)	(0.0714)	(0.991)
Home possess H	0.0527	-0.985	0.0917	-0.73	0.0566	-1.456	0.0984**	-1.814	0.0223	-3.941	0.0387	-3.701
	(0.216)	(4.476)	(0.0618)	(4.572)	(0.193)	(2.773)	(0.0491)	(2.944)	(0.108)	(3.088)	(0.0634)	(3.315)
Home possess M	-0.377	3.962	-0.428*	4.433	-0.362	0.564	-0.410**	0.455	-0.385	1.737	-0.437**	1.361
	(0.262)	(5.660)	(0.219)	(5.598)	(0.258)	(4.013)	(0.171)	(4.041)	(0.311)	(4.538)	(0.208)	(4.635)
TL spoken ALs	0.0883	0.731	0.0880	0.541	0.0184	-0.0427	0.0183	-0.129	-0.143	-2.692	-0.143	-3.068
	(0.151)	(3.282)	(0.153)	(3.231)	(0.136)	(2.444)	(0.129)	(2.402)	(0.158)	(2.582)	(0.135)	(2.753)
PC at H&SCL	-0.285	0.654	-0.276	0.588	-0.205	0.512	-0.199	0.566	-0.169	0.0739	-0.164	-0.0393
	(0.273)	(0.715)	(0.237)	(0.789)	(0.170)	(0.575)	(0.154)	(0.583)	(0.271)	(0.890)	(0.260)	(0.900)
PC at H/SCL	-0.0217	0.894	-0.0348	1.362	-0.0183	-0.708	-0.0294	-0.0614	0.0139	2.597	0.0223	2.916
	(0.101)	(2.658)	(0.0469)	(2.839)	(0.0766)	(1.934)	(0.0347)	(2.076)	(0.0309)	(2.873)	(0.0300)	(2.544)
Male teacher	0.0829	0.0601	0.0718	-0.0413	0.0685	-0.558	0.0593	-0.498	0.142	-0.231	0.123	-0.209
	(0.173)	(4.054)	(0.136)	(4.165)	(0.131)	(3.554)	(0.114)	(3.895)	(0.163)	(4.756)	(0.141)	(4.667)
T. Experience	-0.00896	4.613	-0.0124	4.666	-0.0158	-3.592	-0.0219	-3.199	-0.0101	3.859	-0.0140	4.493
	(0.0464)	(9.983)	(0.0308)	(9.657)	(0.175)	(5.387)	(0.0504)	(5.310)	(0.0432)	(6.885)	(0.0306)	(7.369)
T. Certificate!	0.00712	-3.738	0.00801	-3.385	-0.000230	-3.650	-0.000259	-3.304	0.00435	-4.788	0.00489	-4.676
	(0.0530)	(5.570)	(0.0412)	(5.852)	(0.0287)	(3.539)	(0.0306)	(3.631)	(0.0687)	(4.455)	(0.0427)	(5.287)
M SCL RCS	0.0117	-0.465	0.0123	-1.603	0.0239	-1.883	0.0251	-1.339	0.0714	-4.904	0.0750	-3.37
	(0.0795)	(13.03)	(0.0845)	(13.74)	(0.0572)	(5.683)	(0.0560)	(5.578)	(0.101)	(9.082)	(0.106)	(7.501)
L SCL RSC	-0.0190	0.330	-0.00945	0.229	-0.0194	0.547	-0.00966	0.705	0.00419	0.881	0.00208	0.94
	(0.0698)	(1.695)	(0.0313)	(1.683)	(0.0472)	(1.099)	(0.0258)	(1.116)	(0.0488)	(1.431)	(0.0279)	(1.351)
T. UNI Degree	-0.0138	0.952	-0.0122	1.051	-0.0135	0.398	-0.0120	0.452	0.0227	0.431	0.0201	0.595
	(0.0932)	(1.419)	(0.0608)	(1.662)	(0.0668)	(1.005)	(0.0441)	(1.013)	(0.140)	(1.594)	(0.0764)	(1.639)
COMMU.>50000	0.0473	-3.920	0.0403	-3.641	0.0189	-2.021	0.0161	-1.822	-0.0387	-1.633	-0.0330	-1.509
	(0.0883)	(3.805)	(0.0690)	(3.440)	(0.0551)	(2.250)	(0.0462)	(2.305)	(0.0823)	(3.453)	(0.0635)	(3.572)
Pov 50% Disadv	0.00161	-3.466	0.00188	-3.718	-0.0143	0.738	-0.0166	0.721	-0.00847	1.141	-0.00988	0.676
	(0.0590)	(3.893)	(0.0645)	(3.968)	(0.0455)	(2.947)	(0.0518)	(3.004)	(0.0770)	(3.507)	(0.0639)	(3.477)
Class size	0.689	-25.96	0.707	-34.35	0.501	-38.89	0.514	-46.07	0.524	-42.75	0.537	-49.09
	(1.185)	(76.10)	(0.960)	(75.29)	(0.879)	(62.48)	(0.714)	(65.39)	(0.827)	(61.10)	(0.876)	(61.67)
Class size sq	-0.181	11.80	-0.185	16.46	-0.0717	24.77	-0.0732	29.27	-0.173	18.39	-0.177	21.4
	(0.636)	(46.79)	(0.458)	(46.13)	(0.368)	(37.72)	(0.333)	(38.06)	(0.413)	(39.61)	(0.462)	(39.83)
Constant		19.08		24.48		36.65		39.05		40.74		42.16
		(47.58)		(50.01)		(34.31)		(37.34)		(29.48)		(29.12)
Total (Expl/Unexpl)	**-1.552****	**8.089*****	**-1.325****	**8.087****	**-1.736*****	**8.389*****	**-1.395*****	**8.178*****	**-2.209***	**7.021****	**-2.156****	**7.033****
	(0.748)	**(3.136)**	**(0.597)**	**(3.193)**	**(0.656)**	**(2.333)**	**(0.503)**	**(2.278)**	**(1.165)**	**(3.091)**	**(0.997)**	**(3.104)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	314.0***	**307.5*****	**6.537****		**389.6*****	**382.9*****	**6.653*****		**466.7*****	**461.9*****	**4.812***	
	(3.323)	**(3.221)**	**(3.156)**		**(2.628)**	**(2.819)**	**(2.396)**		**(2.454)**	**(2.582)**	**(2.849)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (parents nationality not included in Algeria, Native parents) Dummy controls for missing observations included.

Table B-5.2: Syria detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.0325	1.887	-0.0253	1.834	-0.0544	0.836	-0.0423	-0.459	-0.0878	2.021	-0.0682	-1.542
	(0.260)	(4.528)	(0.165)	(4.890)	(0.144)	(3.336)	(0.0942)	(3.588)	(0.286)	(4.064)	(0.160)	(5.186)
Upper-sec	-0.281	3.810	-0.383	4.427	0.185	0.612	0.252	0.383	0.258	1.794	0.351	-0.84
	(0.444)	(3.286)	(0.563)	(3.824)	(0.360)	(2.954)	(0.504)	(3.690)	(0.488)	(3.353)	(0.657)	(4.362)
Post-sec not UNI	0.452	4.998	0.561	4.457	0.409	1.633	0.509*	1.885	0.485	3.058	0.603	2.129
	(0.354)	(4.261)	(0.355)	(4.595)	(0.346)	(3.221)	(0.277)	(3.523)	(0.568)	(3.548)	(0.419)	(4.514)
University degree	0.00228	0.924	0.128	1.31	0.00310	-0.445	0.174	-1.219	0.00334	0.0460	0.188	-0.249
	(0.185)	(2.419)	(0.107)	(3.201)	(0.381)	(1.962)	(0.144)	(2.041)	(0.481)	(2.440)	(0.156)	(3.065)
Native parents	-1.533**	8.023	-1.608**	8.956	-1.218**	15.79*	-1.278***	20.89*	-0.637	5.867	-0.668	6.526
	(0.761)	(14.37)	(0.744)	(14.94)	(0.593)	(9.190)	(0.441)	(11.07)	(0.571)	(10.97)	(0.572)	(13.90)
One bookcases	-0.0781	-0.825	-0.0644	-0.565	-0.0713	-0.110	-0.0587	-0.295	-0.0533	-0.649	-0.0439	-0.671
	(0.107)	(2.350)	(0.0852)	(2.121)	(0.109)	(2.139)	(0.0804)	(2.332)	(0.187)	(3.323)	(0.126)	(3.570)
Two bookcases	0.0383	0.455	0.0183	0.877	-0.0106	0.339	-0.00507	0.466	-0.0914	0.312	-0.0436	-1.372
	(0.0637)	(1.934)	(0.0301)	(1.863)	(0.0541)	(1.310)	(0.0281)	(1.731)	(0.254)	(2.323)	(0.108)	(2.696)
Home possess H	-2.072	5.683	-1.778**	2.854	-2.068	0.206	-1.774***	-1.465	-1.577	-0.0711	-1.353*	-0.346
	(1.333)	(6.072)	(0.775)	(4.990)	(1.381)	(5.491)	(0.679)	(5.926)	(1.304)	(7.412)	(0.733)	(8.278)
Home possess M	0.570	6.680	0.463	1.548	0.491	2.326	0.398	0.508	0.291	-0.0271	0.236	0.723
	(0.600)	(8.112)	(0.282)	(8.326)	(0.715)	(6.771)	(0.288)	(7.088)	(0.590)	(7.649)	(0.222)	(9.309)
TL spoken ALs	0.613	6.104	0.337	2.676	0.0688	3.480	0.0378	-1.753	-0.0592	-0.724	-0.0325	-5.032
	(0.644)	(13.26)	(0.340)	(14.98)	(0.320)	(6.066)	(0.175)	(7.210)	(0.479)	(8.920)	(0.263)	(11.88)
PC at H&SCL	0.310	-1.990	0.263	-1.858	0.377	-2.594	0.321	-0.944	0.158	-1.260	0.134	-1.383
	(0.395)	(6.021)	(0.235)	(7.341)	(0.436)	(5.204)	(0.271)	(5.344)	(0.318)	(5.854)	(0.236)	(6.276)
PC at H/SCL	1.214	-6.914	1.454**	-5.715	1.214*	-7.163	1.453***	-3.165	0.442	-1.636	0.529	-1.172
	(0.753)	(6.854)	(0.683)	(8.296)	(0.632)	(5.261)	(0.528)	(5.750)	(0.650)	(7.716)	(0.732)	(8.350)
Male teacher	0.303	6.637	0.300	5.963	1.325	5.257	1.315	5.657	3.042	4.998	3.020	5.935
	(2.731)	(5.790)	(2.717)	(5.793)	(2.322)	(5.172)	(2.309)	(5.279)	(2.358)	(5.616)	(2.357)	(6.088)
T. Experience	0.218	-12.97	0.107	-9.876	-0.100	-10.63	-0.0494	-6.198	0.356	-13.06	0.176	-12.76
	(1.015)	(13.49)	(0.488)	(12.78)	(1.050)	(13.16)	(0.486)	(13.94)	(0.875)	(10.80)	(0.421)	(11.29)
T. Certificate!	0.250	-1.723	0.540	-3.721	0.299	-8.560	0.646	-10.76	0.0410	-0.917	0.0886	-2.054
	(1.005)	(16.43)	(0.657)	(15.68)	(0.989)	(14.64)	(0.627)	(15.23)	(0.475)	(15.24)	(0.620)	(17.91)
M SCL RCS	-0.0535	-6.710	-0.0105	-10.05	0.0294	-7.921	0.00577	-11.12	0.00735	-21.58	0.00144	-29.04
	(0.547)	(25.40)	(0.361)	(23.97)	(0.485)	(23.01)	(0.408)	(22.42)	(0.389)	(19.85)	(0.230)	(20.33)
L SCL RSC	-1.527	-1.000	-1.467	-1.756	0.970	-0.507	0.932	-0.686	0.0552	-0.804	0.0530	-1.058
	(2.844)	(1.410)	(2.569)	(1.629)	(2.206)	(0.994)	(2.008)	(1.026)	(1.387)	(0.944)	(1.327)	(1.006)
T. UNI Degree	1.485	3.883	1.526	1.506	0.911	2.514	0.936	0.902	0.186	1.581	0.192	-2.244
	(1.360)	(7.914)	(1.112)	(6.857)	(1.296)	(5.429)	(1.006)	(5.671)	(0.772)	(6.390)	(0.764)	(7.148)
COMMU.>50000	-0.843	2.102	-0.673	0.162	0.296	1.607	0.236	-1.171	0.835	3.952	0.666	0.508
	(1.159)	(8.543)	(0.867)	(8.299)	(0.599)	(5.768)	(0.483)	(6.390)	(1.246)	(7.255)	(0.956)	(7.545)
Pov 50% Disadv	-3.405	-9.241	-3.407*	-7.052	-4.224	-11.65*	-4.226**	-9.161	-4.459	-9.608	-4.461***	-9.886
	(2.657)	(7.310)	(1.939)	(6.623)	(3.289)	(6.716)	(1.831)	(6.786)	(3.265)	(6.014)	(1.731)	(7.043)
Class size	5.118	-22.81	2.613	44.27	3.802	55.96	1.941	71.86	2.536	134.9	1.295	112.2
	(6.193)	(207.9)	(3.295)	(207.0)	(3.880)	(237.6)	(2.028)	(243.4)	(3.599)	(260.4)	(1.854)	(261.3)
Class size sq	-2.605	10.14	-0.520	-39.58	-2.018	-30.34	-0.402	-45.1	-0.718	-92.89	-0.143	-87.84
	(4.981)	(119.5)	(1.964)	(120.0)	(2.676)	(133.6)	(0.733)	(137.5)	(3.014)	(149.7)	(0.795)	(150.3)
Constant		16.05		13.50		11.09		14.11		4.382		51.77
		(107.9)		(105.3)		(128.1)		(130.5)		(129.7)		(130.1)
Total (Expl/Unexpl)	**-5.365**	**16.03***	**-2.894**	**13.58**	**-2.476**	**23.21*****	**-0.00472**	**22.48*****	**2.483**	**15.74***	**-0.800**	**15.39***
	(6.551)	**(9.299)**	**(3.391)**	**(9.484)**	**(5.920)**	**(7.581)**	**(3.261)**	**(8.133)**	**(6.932)**	**(8.257)**	**(3.262)**	**(9.324)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	296.6***	**285.9*****	**10.67**		**405.7*****	**385.0*****	**20.73*****		**510.8*****	**492.6*****	**18.22*****	
	(6.700)	**(6.494)**	**(7.993)**		**(5.767)**	**(4.977)**	**(6.812)**		**(5.520)**	**(5.169)**	**(5.975)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.3: Tunisia detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.137	1.926	0.142	1.87	0.163	1.779	0.169	2.212	0.438	0.0804	0.454	0.468
	(0.454)	(4.722)	(0.450)	(4.907)	(0.317)	(3.151)	(0.234)	(3.283)	(0.381)	(4.253)	(0.299)	(4.416)
Upper-sec	0.0285	1.274	0.0303	1.809	-0.0159	2.786	-0.0169	3.166	0.0753	3.398	0.0801	4.115
	(0.187)	(4.098)	(0.199)	(3.909)	(0.133)	(3.705)	(0.119)	(3.713)	(0.181)	(4.397)	(0.167)	(4.601)
Post-sec not UNI	0.00490	-0.163	0.00578	0.288	-0.000391	-0.861	-0.000461	-0.63	-0.0195	-1.348	-0.0230	-0.828
	(0.0597)	(3.351)	(0.0707)	(3.194)	(0.0567)	(1.975)	(0.0427)	(2.094)	(0.155)	(3.037)	(0.0541)	(3.199)
University degree	0.135	0.394	0.145	0.322	0.109	-0.0676	0.117	0.0384	0.448	0.315	0.481	0.513
	(0.349)	(3.443)	(0.353)	(3.358)	(0.137)	(1.351)	(0.133)	(1.481)	(0.407)	(4.188)	(0.312)	(4.204)
Native parents	-1.001*	17.89	-1.007***	16.76	-0.829**	15.30	-0.834***	15.15	-0.546**	-2.035	-0.549***	-3.956
	(0.566)	(18.13)	(0.369)	(18.39)	(0.378)	(10.51)	(0.215)	(10.40)	(0.241)	(11.08)	(0.176)	(11.08)
One bookcases	-0.240	0.452	-0.248*	0.5	-0.438*	0.604	-0.452**	0.292	-0.778	2.649	-0.802***	2.213
	(0.163)	(1.987)	(0.150)	(1.977)	(0.259)	(2.861)	(0.219)	(2.647)	(0.481)	(2.928)	(0.265)	(2.913)
Two bookcases	0.0261	-0.587	0.0268	-0.374	0.258	-0.209	0.265**	-0.107	0.547	-2.371	0.562***	-2.239
	(0.109)	(0.804)	(0.113)	(0.837)	(0.246)	(1.067)	(0.127)	(1.016)	(0.532)	(1.669)	(0.182)	(1.692)
Home possess H	0.606	-4.665	0.593*	-4.569	0.741	-4.524	0.726***	-4.35	0.545	-4.533	0.534**	-5.257
	(0.509)	(6.931)	(0.326)	(6.776)	(0.565)	(3.992)	(0.209)	(4.158)	(0.472)	(4.240)	(0.223)	(4.459)
Home possess M	-0.172	-8.920	-0.167	-9.178	-0.424	-6.661	-0.410**	-5.479	-0.204	-5.455	-0.197	-6.001
	(0.350)	(8.198)	(0.308)	(8.987)	(0.271)	(5.026)	(0.194)	(5.152)	(0.235)	(3.666)	(0.180)	(3.897)
TL spoken ALs	-0.222	-0.535	-0.228*	-0.369	-0.167	0.123	-0.171	0.0248	-0.268	-0.0314	-0.275***	-0.0648
	(0.197)	(1.163)	(0.132)	(1.141)	(0.181)	(0.937)	(0.117)	(0.976)	(0.167)	(0.694)	(0.0987)	(0.713)
PC at H&SCL	-0.293	0.217	-0.280	-0.0088	-0.356	-0.257	-0.340***	-0.307	-0.127	0.310	-0.121	0.252
	(0.215)	(0.866)	(0.200)	(0.876)	(0.229)	(0.655)	(0.113)	(0.650)	(0.129)	(0.443)	(0.0971)	(0.429)
PC at H/SCL	-0.422	-1.197	-0.418**	-2.06	-0.292	-1.953	-0.289**	-1.917	-0.0944	2.867	-0.0936	2.553
	(0.299)	(7.059)	(0.208)	(6.532)	(0.259)	(3.351)	(0.114)	(3.358)	(0.125)	(3.229)	(0.104)	(3.283)
Male teacher	0.00285	2.004	0.00112	3.065	0.00370	1.074	0.00145	1.434	0.000129	3.451	5.09e-05	4.53
	(0.142)	(4.871)	(0.0437)	(4.705)	(0.0855)	(4.506)	(0.0267)	(4.313)	(0.0352)	(5.841)	(0.0124)	(5.841)
T. Experience	-0.0998	-1.872	-0.105	-2.545	-0.172	-1.247	-0.181	-1.116	-0.204	4.540	-0.213	4.73
	(0.217)	(9.484)	(0.221)	(9.310)	(0.233)	(3.777)	(0.113)	(3.820)	(0.360)	(7.125)	(0.205)	(6.947)
T. Certificate!	-0.00521	-5.228	-0.00597	-3.74	-0.0280	1.019	-0.0321	2.386	0.0380	-2.525	0.0435	-1.784
	(0.0910)	(6.867)	(0.0708)	(6.465)	(0.0779)	(10.10)	(0.0771)	(10.21)	(0.0785)	(12.39)	(0.0987)	(12.71)
M SCL RCS	0.0160	5.638	0.0236	6.018	-0.0100	-0.467	-0.0147	0.488	0.00792	-0.976	0.0117	-0.0104
	(0.120)	(8.403)	(0.0789)	(7.203)	(0.168)	(11.28)	(0.0778)	(11.61)	(0.0752)	(12.97)	(0.0590)	(13.33)
L SCL RSC	0.0624	-0.0445	0.0739	0.336	0.0919	-1.668	0.109	-1.365	-0.125	1.598	-0.148	1.692
	(0.211)	(3.523)	(0.242)	(2.836)	(0.175)	(3.533)	(0.166)	(3.434)	(0.230)	(4.211)	(0.181)	(4.219)
T. UNI Degree	-0.0157	19.27	-0.0161	17.63	0.0451	-3.018	0.0461	-3.176	0.0375	-16.10	0.0383	-17.29
	(0.0776)	(18.95)	(0.0722)	(21.09)	(0.147)	(22.98)	(0.0856)	(21.08)	(0.180)	(39.26)	(0.157)	(38.47)
COMMU.>50000	0.0195	0.276	0.0229	0.89	2.40e-05	-0.252	2.81e-05	0.215	0.0284	1.144	0.0332	0.797
	(0.0693)	(1.945)	(0.0810)	(1.798)	(0.0958)	(1.606)	(0.0916)	(1.487)	(0.134)	(2.655)	(0.141)	(2.653)
Pov 50% Disadv	-0.0835	-2.390	-0.0892	-2.327	-0.0964	-2.132	-0.103	-1.191	0.00426	5.093	0.00455	5.338
	(0.0783)	(5.243)	(0.0650)	(5.095)	(0.196)	(4.415)	(0.0761)	(4.080)	(0.0601)	(5.551)	(0.0542)	(5.470)
Class size	0.944	-116.4**	0.809	-125.1**	0.955	-52.43	0.818	-63.21	0.842	24.25	0.721	16.59
	(1.301)	(52.32)	(0.635)	(51.27)	(1.456)	(116.7)	(0.632)	(122.5)	(1.389)	(89.93)	(0.510)	(87.50)
Class size sq	-1.471	62.77*	-1.270*	65.11**	-1.559	29.66	-1.346*	37.3	-1.384	-8.148	-1.195*	-1.387
	(1.303)	(32.80)	(0.732)	(31.95)	(1.510)	(65.31)	(0.754)	(67.52)	(1.250)	(47.97)	(0.643)	(44.34)
Constant		-98.18		-233.2		49.21		45.97		7.250		8.491
		(63.97)		(686.5)		(61.00)		(62.47)		(72.07)		(72.46)
Total (Expl/Unexpl)	**-2.373****	**25.83*****	**-2.150*****	**26.31*****	**-2.383***	**24.90*****	**-1.820*****	**25.02*****	**-0.419**	**15.80*****	**-0.387**	**15.90*****
	(1.146)	**(4.056)**	**(0.634)**	**(4.095)**	**(1.359)**	**(3.486)**	**(0.657)**	**(3.399)**	**(1.853)**	**(4.291)**	**(0.790)**	**(4.242)**
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap		Boys	Girls	Total Gap	
	349.5***	**326.1*****	**23.46*****		**429.7*****	**407.1*****	**22.52*****		**515.3*****	**499.9*****	**15.38*****	
	(4.498)	**(3.338)**	**(4.150)**		**(3.169)**	**(3.189)**	**(3.833)**		**(4.277)**	**(3.814)**	**(4.808)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.4: Turkey detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.0118	1.672	-0.0133	2.077	-0.0994	-7.450	-0.112	-7.391	-0.170	-2.110	-0.192	-1.66
	(0.368)	(9.911)	(0.271)	(10.40)	(0.186)	(7.826)	(0.160)	(7.614)	(0.204)	(5.474)	(0.127)	(4.776)
Upper-sec	-0.493	0.754	-0.508	1.786	-1.166*	-0.144	-1.201***	0.109	-0.693	-0.898	-0.714	-0.75
	(0.480)	(4.961)	(0.491)	(4.733)	(0.697)	(3.929)	(0.414)	(4.214)	(0.552)	(4.003)	(0.476)	(3.851)
Post-sec not UNI	0.0155	-0.251	0.0154	-0.127	0.0522	0.0712	0.0518	0.0717	0.0306	-2.194	0.0304	-2.538*
	(0.0407)	(0.858)	(0.0192)	(0.835)	(0.354)	(0.993)	(0.0780)	(0.973)	(0.284)	(1.694)	(0.0714)	(1.479)
University degree	-0.00728	-1.211	-0.00726	-0.878	-0.251	-1.431	-0.250**	-1.088	-0.876	0.129	-0.873**	-2.162
	(0.119)	(1.776)	(0.0791)	(1.753)	(0.408)	(1.483)	(0.116)	(1.550)	(1.390)	(3.862)	(0.358)	(3.886)
Native parents	-0.869	47.06	-0.787***	60.31	-0.543**	44.43	-0.492***	41.89	-0.220	9.198	-0.199	6.469
	(0.581)	(42.77)	(0.256)	(50.09)	(0.251)	(30.17)	(0.158)	(29.06)	(0.205)	(26.41)	(0.160)	(27.38)
One bookcases	-0.402	0.274	-0.348	0.2	-0.959*	0.244	-0.830***	0.552	-1.306*	5.008	-1.130***	2.919
	(0.380)	(3.258)	(0.271)	(3.431)	(0.505)	(2.628)	(0.194)	(2.871)	(0.711)	(3.799)	(0.378)	(4.117)
Two bookcases	-0.727	1.783	-0.741	1.877	-1.679***	2.001	-1.711***	2.441	-3.616***	7.174*	-3.687***	5.638
	(0.604)	(2.692)	(0.625)	(3.076)	(0.511)	(2.408)	(0.480)	(2.631)	(1.138)	(4.153)	(0.960)	(5.307)
Home possess H	0.598	-10.04	0.538	-7.595	0.663	-5.138	0.596**	-3.743	-0.0892	-5.958	-0.0802	-7.194
	(0.878)	(10.56)	(0.467)	(10.25)	(0.527)	(6.451)	(0.291)	(6.374)	(0.431)	(7.589)	(0.396)	(7.432)
Home possess M	-0.549	-19.50	-0.520	-16.83	-0.671	-0.889	-0.635**	-0.195	0.0528	4.792	0.0500	2.767
	(0.798)	(18.14)	(0.579)	(17.16)	(0.423)	(8.568)	(0.310)	(7.956)	(0.259)	(6.531)	(0.249)	(8.644)
TL spoken ALs	-1.380*	-25.19	-1.398*	-22.58	-2.642***	-3.090	-2.677***	-0.538	-0.156	-17.47	-0.158	-19.34
	(0.816)	(16.04)	(0.829)	(17.49)	(0.769)	(9.856)	(0.705)	(11.06)	(0.884)	(12.75)	(0.895)	(12.84)
PC at H&SCL	-0.00260	-4.366	-0.0763	-4.671	-0.00499	-2.300	-0.146	-1.992	-0.0115	12.02*	-0.337	10.62
	(0.224)	(8.159)	(0.103)	(7.750)	(0.306)	(4.874)	(0.117)	(4.538)	(0.766)	(6.363)	(0.219)	(6.695)
PC at H/SCL	-0.542	-8.490	-0.523	-8.886	-0.726	-2.986	-0.701	-1.569	-0.665	11.31	-0.642	8.797
	(0.845)	(14.61)	(0.770)	(14.87)	(0.598)	(8.420)	(0.546)	(7.437)	(0.615)	(8.178)	(0.560)	(8.536)
Male teacher	-0.294	-0.350	-0.284	0.832	-0.251	0.390	-0.242	-1.075	0.313	-10.84	0.301	-8.282
	(0.344)	(9.717)	(0.247)	(9.498)	(0.240)	(6.243)	(0.182)	(6.182)	(0.474)	(10.55)	(0.335)	(10.68)
T. Experience	-0.0380	-0.342	-0.0440	-0.671	-0.186	-3.827	-0.216	-1.322	-0.205	-5.366	-0.238	-1.786
	(0.288)	(19.31)	(0.265)	(20.61)	(0.422)	(11.49)	(0.283)	(8.873)	(0.412)	(15.64)	(0.463)	(12.86)
T. Certificate!	0.0110	-74.72	0.0137	-100.5	-0.0321	-16.62	-0.0399	-16.33	-0.0381	-0.0530	-0.0474	-6.883
	(0.0824)	(84.68)	(0.102)	(102.2)	(0.0239)	(68.19)	(0.0294)	(79.18)	(0.0404)	(23.32)	(0.0494)	(22.93)
M SCL RCS	0.0166	3.639	-0.0793	5.741	0.0361	-7.414	-0.173	-2.878	0.00267	6.796	-0.0128	5.764
	(0.300)	(11.26)	(0.155)	(10.41)	(0.571)	(13.92)	(0.296)	(13.84)	(0.0701)	(28.68)	(0.107)	(30.35)
L SCL RSC	-0.254	0.566	-0.140	1.991	-0.324	-1.941	-0.178	-0.0282	0.0395	5.950	0.0217	5.726
	(0.567)	(6.337)	(0.298)	(6.169)	(0.623)	(4.664)	(0.322)	(4.707)	(0.302)	(10.50)	(0.169)	(10.93)
T. UNI Degree	0.172	6.982	0.188	4.75	0.203	-8.913	0.223	-10.34	-0.538	-27.07	-0.591	-24.07
	(0.348)	(24.60)	(0.359)	(26.18)	(0.407)	(14.70)	(0.387)	(11.58)	(0.903)	(24.40)	(0.892)	(20.93)
COMMU.>50000	-0.0109	14.36	-0.0423	15.47	-0.00552	4.757	-0.0213	4.647	-0.0101	-0.858	-0.0391	-1.508
	(0.569)	(12.08)	(0.192)	(12.60)	(0.260)	(6.996)	(0.0864)	(7.768)	(0.558)	(10.58)	(0.191)	(10.53)
Pov 50% Disadv	-0.379	1.626	-0.421	-1.989	-0.807*	3.491	-0.897**	2.129	-1.806*	-8.898	-2.008***	-6.182
	(0.282)	(9.401)	(0.311)	(9.290)	(0.464)	(7.753)	(0.409)	(7.329)	(0.939)	(12.13)	(0.692)	(12.67)
Class size	0.237	-89.04	0.193	-68.87	-0.765	7.609	-0.622	24.61	2.323	-106.9	1.889	-100.7
	(0.537)	(88.53)	(0.437)	(84.03)	(0.818)	(86.33)	(0.592)	(81.21)	(2.391)	(111.4)	(1.333)	(114.2)
Class size sq	-0.109	37.60	-0.0763	27.41	0.733	-0.198	0.513	-6.335	-1.885	62.03	-1.321	59.54
	(0.453)	(38.50)	(0.323)	(35.77)	(0.709)	(39.04)	(0.456)	(36.32)	(1.765)	(51.07)	(0.925)	(53.07)
Constant		123.9		117.4		10.67		-10.85		86.91		96.29
		(85.88)		(110.2)		(91.12)		(97.19)		(101.7)		(101.8)
Total (Expl/Unexpl)	**-6.409*** (2.195)**	**4.219 (6.755)**	**-5.654*** (1.564)**	**4.147 (7.007)**	**-9.579*** (1.989)**	**9.525** (4.376)**	**-10.08*** (1.231)**	**9.724** (4.400)**	**-8.819*** (3.351)**	**15.16* (8.050)**	**-10.32*** (1.882)**	**14.73* (7.627)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	295.9* (4.821)**	**298.1*** (7.729)**	**-2.190 (6.928)**		**424.3*** (5.205)**	**424.3*** (6.057)**	**-0.0535 (4.704)**		**584.1*** (8.536)**	**577.7*** (7.330)**	**6.344 (7.251)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.5: Iran detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.101	-5.306	2.152	8.919	-0.0174	-2.509	-0.369	9.443	0.0225	-0.821	0.478	10.44
	(0.301)	(5.514)	(4.389)	(12.42)	(0.0743)	(3.178)	(1.363)	(16.75)	(0.155)	(3.418)	(2.424)	(18.55)
Upper-sec	-0.0751	-1.052	0.241	3.369	-0.805*	0.155	2.584	2.155	-1.263*	6.726**	4.053	5.179
	(0.589)	(4.128)	(1.800)	(5.538)	(0.485)	(2.365)	(3.288)	(7.003)	(0.672)	(3.406)	(4.982)	(9.515)
Post-sec not UNI	0.0953	-0.818	0.470	0.781	0.257	-1.237	1.269	-0.487	0.620	3.995*	3.058	-2.615
	(0.250)	(1.609)	(1.237)	(2.404)	(0.301)	(1.775)	(2.532)	(3.723)	(0.898)	(2.366)	(7.636)	(17.04)
University degree	0.0307	-0.957	-0.435	1.995	-0.128	-1.892	1.808	-1.269	-0.546	3.242	7.748*	-2.134
	(0.319)	(2.494)	(1.705)	(3.112)	(0.344)	(1.917)	(1.454)	(4.624)	(1.645)	(3.196)	(4.304)	(4.484)
Native parents	-0.579	36.77	-1.686	-4.024	-0.461	47.70**	-1.342	13.59	-0.391	6.656	-1.141	-79.29
	(0.573)	(31.52)	(3.095)	(31.51)	(0.284)	(21.97)	(1.695)	(26.50)	(0.238)	(19.08)	(1.483)	(196.5)
One bookcases	0.00773	-1.910	0.277	-2.525	0.0924	0.470	3.311	3.836*	0.168	3.209	6.022	-4.511
	(0.0548)	(1.711)	(1.451)	(2.588)	(0.471)	(1.940)	(3.959)	(2.234)	(1.018)	(3.089)	(8.311)	(7.375)
Two bookcases	0.220	-2.339	-0.778	-1.505	-0.0913	-1.723	0.322	2.734**	-0.267	-2.336	0.944	1.752
	(0.491)	(2.019)	(1.936)	(1.114)	(0.294)	(2.011)	(1.042)	(1.376)	(0.435)	(3.221)	(1.488)	(14.02)
Home possess H	0.0273	1.924	1.369	-3.276	0.0867	2.901	4.346	-3.553	0.170	9.029	8.506	5.938
	(0.236)	(5.260)	(4.641)	(12.90)	(1.128)	(6.244)	(8.905)	(8.023)	(1.623)	(7.062)	(11.93)	(21.95)
Home possess M	-0.478	4.065	0.485	-7.878	-0.427	5.508	0.434	-2.229	-0.381	6.888	0.387	8.526
	(0.668)	(5.821)	(0.720)	(21.60)	(0.429)	(4.238)	(0.499)	(10.84)	(0.474)	(4.889)	(0.510)	(29.16)
TL spoken ALs	-1.767	2.214	7.383	-7.994	-1.590	-0.953	6.640	-7.677	-0.168	-9.476	0.703	-5.145
	(1.291)	(7.903)	(13.18)	(7.180)	(1.473)	(7.231)	(13.46)	(5.365)	(1.177)	(9.028)	(4.790)	(31.56)
PC at H&SCL	-0.232	-0.120	0.808	-0.927	-0.418	0.666	1.457	-0.974	-1.235	-3.193	4.304*	-6.37
	(0.762)	(1.097)	(0.697)	(1.001)	(0.798)	(1.620)	(0.973)	(1.534)	(2.743)	(5.058)	(2.207)	(5.739)
PC at H/SCL	0.196	-1.536	2.982	-3.739	0.240	1.374	3.653	-2.56	0.0490	-6.329	0.747	-1.594
	(0.720)	(4.683)	(7.753)	(4.962)	(0.471)	(5.346)	(5.357)	(4.955)	(0.244)	(5.575)	(4.008)	(15.06)
Male teacher	8.091	4.387	8.709	4.612	0.378	3.375	0.407	7.087	9.413	3.963	10.13	10.54
	(55.08)	(7.465)	(55.95)	(2.828)	(38.27)	(5.675)	(38.48)	(4.586)	(36.57)	(6.101)	(37.64)	(10.52)
T. Experience	0.528	-1.084	3.013	-5.037	0.275	-4.118	1.567	-1.255	-0.414	-25.60	-2.362	2.125
	(1.342)	(16.92)	(8.987)	(13.42)	(0.977)	(13.21)	(5.874)	(13.17)	(1.080)	(17.28)	(7.915)	(32.56)
T. Certificate!												
M SCL RCS	-0.316	-10.20	-11.94	3.206	-0.370	-7.677	-13.99	6.297	-0.681	-25.20	-25.74	-13.79
	(1.821)	(11.27)	(21.65)	(10.96)	(1.570)	(12.41)	(18.98)	(11.24)	(3.577)	(30.71)	(44.21)	(31.88)
L SCL RSC	0.0785	-8.479*	35.02	-0.856	0.0629	-4.645	28.05	-1.012	0.0599	-4.579	26.75	-8.639
	(2.832)	(4.632)	(43.54)	(3.146)	(2.102)	(4.397)	(33.09)	(3.485)	(2.763)	(7.893)	(46.91)	(10.78)
T. UNI Degree	0.447	-7.431	-2.198	-3.336	-0.458	2.114	2.252	2.978	-1.546	13.55	7.596	7.582
	(1.598)	(9.660)	(7.025)	(7.591)	(0.889)	(6.089)	(3.876)	(6.134)	(1.808)	(9.493)	(6.620)	(16.78)
COMMU.>50000	-0.0877	-17.46*	-3.319	-14.98*	0.208	-0.564	7.892	-12.33	0.338	11.89	12.81	1.286
	(0.390)	(10.21)	(7.277)	(7.919)	(1.354)	(9.181)	(12.86)	(8.329)	(2.281)	(9.861)	(20.31)	(18.59)
Pov 50% Disadv	-1.638	-4.198	5.257	0.423	-1.811	-3.163	5.812	0.253	-1.309	-6.943	4.201	-12.31
	(1.644)	(7.575)	(6.825)	(5.800)	(1.607)	(5.558)	(8.376)	(4.313)	(2.013)	(9.199)	(8.585)	(12.59)
Class size	13.49	259.3	93.62	-56.39	2.824	158.3	19.60	28.72	-5.745	218.7	-39.87	218.7
	(13.47)	(208.3)	(136.6)	(195.8)	(5.624)	(137.7)	(39.73)	(160.0)	(9.812)	(183.4)	(102.1)	(361.5)
Class size sq	-9.036	-106.9	-69.21	44.75	-1.582	-76.09	-12.11	7.587	4.060	-136.3	31.10	-73.95
	(11.26)	(108.4)	(123.0)	(111.1)	(4.564)	(72.57)	(36.73)	(97.54)	(8.364)	(100.9)	(92.57)	(224.5)
Constant		-162.2		-25.09		-120.2		-112.3*		-65.76		-69.71
		(107.7)		(72.93)		(87.77)		(65.55)		(95.95)		(328.2)
Total (Expl/Unexpl)	**8.943**	**-25.18**	**66.30**	**63.05***	**-6.725**	**0.0366**	**60.13**	**-73.11****	**-4.121**	**6.596**	**60.14**	**-21.31**
	(55.52)	**(55.83)**	**(75.28)**	**(33.34)**	**(37.70)**	**(38.61)**	**(85.85)**	**(33.48)**	**(37.25)**	**(38.08)**	**(69.05)**	**(78.97)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	287.5***	**303.7*****	**-16.24***		**397.8*****	**404.5*****	**-6.689**		**517.4*****	**514.9*****	**2.475**	
	(7.344)	**(5.504)**	**(9.314)**		**(6.456)**	**(5.387)**	**(8.398)**		**(9.796)**	**(10.17)**	**(14.02)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.6: Jordan detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.0559	1.335	0.0115	14.44	0.0998	-0.367	-0.0205	-1.633	-0.147	1.850	0.0301	-0.293
	(0.481)	(3.498)	(0.199)	(14.97)	(0.341)	(1.941)	(0.432)	(8.300)	(0.183)	(1.648)	(0.178)	(3.034)
Upper-sec	-1.738	3.852	-1.161	41.99	-0.842	1.422	-0.563	24.62	-0.742	7.396	-0.496	6.764
	(1.234)	(7.692)	(1.934)	(37.75)	(0.730)	(5.612)	(0.625)	(21.51)	(0.583)	(5.131)	(0.742)	(8.208)
Post-sec not UNI	-1.501	2.047	0.434	24.3	-1.907*	-0.0170	0.551	11.18	-1.657**	6.526**	0.479	-0.842
	(1.079)	(5.884)	(1.142)	(24.13)	(1.049)	(5.366)	(1.252)	(16.17)	(0.715)	(3.326)	(0.964)	(4.137)
University degree	1.767	0.887	-1.725	26.88	2.221**	-0.761	-2.168	15.57	2.513**	4.485	-2.453	-1.397
	(1.379)	(6.339)	(2.444)	(32.38)	(1.055)	(5.540)	(2.431)	(20.45)	(1.151)	(4.403)	(2.575)	(6.506)
Native parents	0.127	-10.31	-0.0255	2.996	0.114	-6.303	-0.0229	7.421	0.440	-15.92*	-0.0887	-3.629
	(0.259)	(11.69)	(0.537)	(25.33)	(0.424)	(7.964)	(1.175)	(23.11)	(0.508)	(9.268)	(1.442)	(22.73)
One bookcases	-0.564	2.010	0.592	-14.13	-0.737*	4.718	0.774	2.009	-0.551	1.515	0.579	0.648
	(0.357)	(4.458)	(0.536)	(11.33)	(0.401)	(3.601)	(0.783)	(13.61)	(0.344)	(3.440)	(0.526)	(6.912)
Two bookcases	0.0261	0.232	-0.351	-2.513	0.101	2.310	-1.357	-4.272	0.0835	1.005	-1.125	2.987
	(0.0387)	(2.853)	(0.488)	(5.266)	(0.379)	(3.186)	(1.189)	(6.188)	(0.555)	(3.742)	(2.068)	(7.723)
Home possess H	0.239	-3.518	-6.592	14.81	0.184	-5.208	-5.078	-63.84	0.0503	3.448	-1.388	-8.56
	(2.491)	(17.79)	(7.975)	(72.74)	(2.203)	(8.699)	(6.894)	(58.45)	(0.631)	(7.372)	(2.361)	(23.82)
Home possess M	-4.056**	5.031	1.704	34.01	-1.998	-7.493	0.839	-73.91	-0.601	0.532	0.252	-2.681
	(2.002)	(17.59)	(4.843)	(61.86)	(1.283)	(7.223)	(3.095)	(59.43)	(0.578)	(6.009)	(0.902)	(18.97)
TL spoken ALs	-0.305	-1.465	-0.861	13.62	-1.069	-12.00	-3.022	-43.01	-0.457	-0.623	-1.293	8.692
	(0.581)	(14.44)	(2.123)	(38.87)	(0.945)	(9.461)	(3.993)	(26.69)	(0.501)	(10.32)	(2.125)	(23.13)
PC at H&SCL	0.315	-6.763	0.797	0.0442	-0.197	3.369	-0.499	47.7	-0.277	-0.651	-0.700	30.31
	(0.979)	(12.48)	(1.892)	(15.38)	(0.425)	(10.42)	(1.048)	(40.40)	(0.371)	(8.965)	(0.822)	(37.52)
PC at H/SCL	-0.175	-10.43	-1.467	-8.456	-0.0732	-2.696	-0.614	6.228	0.000147	1.860	0.00123	23.02
	(1.839)	(12.72)	(3.076)	(21.54)	(0.719)	(7.387)	(1.379)	(34.52)	(0.186)	(7.593)	(0.433)	(25.57)
Male teacher	23.44	1.316*	22.96	0.235	14.96	0.523	14.66	0.401	13.30	0.863	13.02	1.286
	(21.85)	(0.726)	(21.41)	(1.157)	(27.44)	(0.520)	(26.96)	(1.442)	(21.63)	(0.593)	(21.22)	(0.852)
T. Experience	0.0648	-3.342	-0.294	-25.08	-0.0503	-13.33	0.229	-34.43	-0.175	-23.45**	0.793	-98.68
	(0.364)	(14.53)	(1.124)	(38.88)	(0.381)	(11.92)	(0.923)	(66.17)	(1.593)	(9.639)	(2.876)	(60.09)
T. Certificate!	0.276	8.646	-0.839	-4.717	0.0401	-0.557	-0.122	8.166	0.0131	-1.648	-0.0399	17.61
	(0.857)	(16.52)	(2.502)	(34.28)	(1.025)	(17.71)	(2.671)	(85.72)	(0.827)	(15.36)	(2.941)	(50.80)
M SCL RCS	0.140	-22.26	0.296	-44.8	0.112	-21.16	0.237	-59.19	0.133	-11.71	0.281	-109.9
	(1.755)	(16.77)	(3.881)	(37.51)	(0.711)	(18.59)	(1.819)	(79.92)	(1.370)	(14.92)	(3.104)	(77.84)
L SCL RSC	-0.0257	-6.501*	-3.524	-5.699	-0.0223	-7.862**	-3.058	-11.89	-0.0179	-3.769	-2.445	-15.56
	(1.823)	(3.342)	(2.283)	(5.034)	(1.094)	(3.359)	(2.155)	(9.549)	(1.169)	(3.109)	(1.725)	(10.42)
T. UNI Degree	-1.713	55.01	0.158	57.63	-1.224	34.30	0.113	-26.64	-0.529	25.90	0.0490	46.39
	(2.561)	(40.57)	(4.889)	(38.64)	(1.593)	(34.77)	(2.571)	(76.46)	(0.914)	(35.17)	(1.050)	(65.03)
COMMU.>50000	0.452	-8.241	0.0890	-21.58	2.316	-3.664	0.456	-79.98***	1.851	-1.388	0.364	-14.27
	(1.393)	(9.902)	(0.512)	(17.68)	(2.124)	(8.102)	(4.389)	(24.92)	(1.724)	(6.710)	(3.721)	(18.67)
Pov 50% Disadv	2.139	-1.786	0.564	-9.768	1.838	-1.984	0.485	46.52	0.327	6.246	0.0861	-9.626
	(2.575)	(9.604)	(5.048)	(19.26)	(2.025)	(10.17)	(3.021)	(29.12)	(1.227)	(7.522)	(0.866)	(16.81)
Class size	0.958	-27.11	-2.889	171.3	1.979	-27.12	-5.966	-51.91	-0.0892	172.3	0.269	690.1
	(6.916)	(207.4)	(15.81)	(467.6)	(3.741)	(180.8)	(9.999)	(839.6)	(3.462)	(172.3)	(8.961)	(870.3)
Class size sq	0.725	-10.98	-2.180	-59.47	1.094	-18.12	-3.289	18.21	1.586	-95.96	-4.770	-351.8
	(6.401)	(111.1)	(15.79)	(269.7)	(5.386)	(91.09)	(12.70)	(487.6)	(3.663)	(86.07)	(10.21)	(389.1)
Constant		-19.02		-246.6		56.07		254.3		-106.0		-249.2
		(161.7)		(252.3)		(122.6)		(317.1)		(133.7)		(476.0)
Total (Expl/Unexpl)	**13.68**	**-51.54****	**18.51**	**-15.00**	**11.56**	**-29.94**	**-4.246**	**22.95**	**15.50**	**-23.68**	**-2.832**	**-28.07**
	(22.31)	**(20.53)**	**(25.79)**	**(26.72)**	**(29.48)**	**(29.45)**	**(28.49)**	**(48.78)**	**(23.50)**	**(24.65)**	**(18.06)**	**(32.72)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	274.0***	**311.9*****	**-37.86*****		**422.9*****	**441.2*****	**-18.38***		**551.7*****	**559.9*****	**-8.183**	
	(7.372)	**(8.635)**	**(10.99)**		**(6.733)**	**(7.779)**	**(10.53)**		**(4.355)**	**(5.762)**	**(7.273)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.7: Saudi Arabia detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.268	-2.092	-1.751	11.57	0.141	-4.004	-0.919	-2.813	0.154	-3.463	-1.003	-1.654
	(0.332)	(3.257)	(2.098)	(48.66)	(0.278)	(2.455)	(1.389)	(4.912)	(0.357)	(2.957)	(1.640)	(5.177)
Upper-sec	0.0751	-1.964	1.706	0.902	0.210	-3.836	4.764	-4	0.352	-3.315	7.987	0.767
	(0.257)	(4.015)	(4.873)	(40.13)	(0.268)	(2.725)	(6.000)	(3.892)	(0.444)	(3.453)	(8.255)	(3.145)
Post-sec not UNI	-0.0625	-0.0203	0.235	4.078	-0.273	0.354	1.027	-1.014	-0.102	-0.0371	0.382	2.787
	(0.233)	(1.131)	(0.690)	(17.92)	(0.298)	(1.049)	(0.770)	(0.930)	(0.269)	(1.464)	(0.934)	(3.099)
University degree	-0.0404	-1.648	0.490	36.38	-0.106	-6.067	1.291	-6.635	-0.187	-5.795	2.272	18.23
	(0.149)	(5.286)	(1.773)	(85.48)	(0.160)	(3.883)	(1.552)	(5.834)	(0.483)	(6.603)	(2.777)	(21.09)
Native parents	0.0955	-0.842	0.393	-40.18	0.313	6.114	1.290	6.262	1.357	-6.378	5.586**	5.757
	(0.547)	(10.61)	(2.135)	(61.56)	(0.436)	(7.333)	(1.780)	(13.75)	(1.020)	(12.05)	(2.585)	(21.98)
One bookcases	-0.814	2.170	0.0699	-24.52	-1.630	0.993	0.140	-2.017	-2.683	5.528	0.230	12.09
	(1.108)	(5.380)	(0.408)	(60.97)	(1.010)	(3.624)	(2.247)	(4.764)	(1.692)	(5.574)	(3.388)	(11.52)
Two bookcases	0.147	-0.680	-0.202	-17.69	-0.369	-0.775	0.507	-0.763	-1.208	-0.0716	1.660	7.696
	(0.802)	(3.317)	(1.085)	(50.63)	(0.531)	(2.549)	(0.721)	(2.116)	(0.960)	(3.558)	(1.269)	(9.321)
Home possess H	-8.180***	17.77	9.278	22.52	-6.917***	12.87	7.846	-3.118	-5.237**	9.336	5.940	24.84
	(3.125)	(16.31)	(9.013)	(92.00)	(1.695)	(9.816)	(5.960)	(15.98)	(2.118)	(9.285)	(5.279)	(30.41)
Home possess M	0.783	15.70	-16.00*	6.076	0.472	6.857	-9.647**	-6.655	0.174	2.820	-3.556	-6.776
	(1.107)	(9.639)	(8.710)	(79.69)	(0.557)	(8.315)	(4.799)	(8.500)	(0.313)	(5.385)	(3.142)	(4.490)
TL spoken ALs	-0.274	3.099	-0.767	10.83	-0.688	-1.857	-1.924	3.434	-1.457	-4.600	-4.076	38.91
	(1.111)	(5.741)	(3.104)	(44.82)	(1.090)	(5.735)	(3.305)	(8.023)	(1.191)	(7.529)	(3.408)	(33.19)
PC at H&SCL	-4.775***	-1.356	-4.175**	2.428	-3.305*	-0.871	-2.889	0.469	-0.894	0.859	-0.781	0.337
	(1.611)	(1.787)	(2.005)	(9.851)	(1.730)	(1.522)	(1.898)	(1.351)	(2.091)	(1.515)	(1.857)	(1.766)
PC at H/SCL	3.168***	-10.93	7.158**	30.62	2.384**	-2.736	5.387**	10.16**	-0.381	9.397	-0.861	6.909
	(1.149)	(10.04)	(3.033)	(34.89)	(1.049)	(6.398)	(2.605)	(4.498)	(1.649)	(9.143)	(3.732)	(9.181)
Male teacher	17.98	0.149	17.70	-0.19	25.21	0.152	24.83	-0.116	-19.00	-0.0288	-18.71	-0.424
	(36.14)	(0.261)	(35.59)	(1.043)	(19.82)	(0.120)	(19.46)	(0.170)	(36.55)	(0.0828)	(36.00)	(0.323)
T. Experience	-0.562	-10.26	-0.456	55.05	0.130	-9.188	0.105	-9.668	0.611	-4.447	0.496	-4.331
	(1.562)	(9.855)	(1.339)	(162.5)	(1.241)	(7.784)	(1.060)	(9.691)	(1.279)	(7.865)	(1.042)	(12.52)
T. Certificate!												
M SCL RCS	-0.140	16.83	-0.799	-12.61	-0.248	32.73**	-1.417	25.67***	0.433	19.61	2.474	27.73**
	(0.501)	(15.33)	(3.315)	(92.71)	(0.616)	(15.01)	(3.196)	(9.605)	(0.678)	(20.80)	(4.275)	(12.99)
L SCL RSC	0.776	1.666	-1.197	-16.93	0.484	4.929	-0.747	7.552**	1.221	2.250	-1.885	20.39*
	(1.974)	(5.560)	(2.562)	(36.01)	(1.623)	(4.828)	(2.213)	(3.344)	(1.983)	(5.535)	(2.599)	(11.59)
T. UNI Degree	-0.164	9.304	0.0434	38.83	-0.0127	17.29	0.00336	-14.13	-0.476	11.53	0.126	-76.4
	(0.894)	(27.16)	(0.174)	(267.3)	(1.059)	(27.55)	(0.520)	(39.26)	(2.123)	(47.37)	(0.706)	(81.14)
COMMU.>50000	-0.311	1.047	4.999	-5.216	-0.358	-0.841	5.758	-5.655	-0.603	2.833	9.693*	2.568
	(1.395)	(7.515)	(5.466)	(142.9)	(1.479)	(6.356)	(4.100)	(8.539)	(1.908)	(7.440)	(5.096)	(9.263)
Pov 50% Disadv	0.0792	0.205	-0.530	-14.29	0.362	-3.049	-2.421	1.737	0.115	-0.697	-0.766	8.225
	(0.357)	(3.172)	(1.712)	(36.45)	(1.201)	(2.792)	(1.872)	(2.546)	(0.291)	(2.784)	(1.593)	(5.720)
Class size	-0.0638	21.81	0.0251	331.2	-1.187	52.15	0.468	100.3	-0.784	37.97	0.309	317.7
	(2.814)	(78.84)	(1.210)	(979.7)	(2.747)	(54.39)	(2.098)	(87.15)	(4.561)	(70.19)	(3.365)	(209.4)
Class size sq	1.300	-12.32	-0.383	-181.2	6.428	-33.05	-1.895	-54.92	4.859	-23.23	-1.433	-186.2
	(10.32)	(40.88)	(3.308)	(531.7)	(7.016)	(27.90)	(2.613)	(49.18)	(12.38)	(42.20)	(4.531)	(126.2)
Constant		-98.18		-233.2		-121.9**		70.66		-41.07		-117.1
		(63.97)		(686.5)		(60.51)		(69.64)		(58.80)		(73.63)
Total (Expl/Unexpl)	**11.00**	**-44.89**	**-1.477**	**48.44**	**23.07**	**-47.34****	**13.65**	**115.1*****	**-19.67**	**9.116**	**-9.293**	**114.1**
	(36.23)	**(34.60)**	**(35.21)**	**(195.2)**	**(20.94)**	**(19.79)**	**(15.43)**	**(18.45)**	**(34.32)**	**(33.67)**	**(42.98)**	**(83.30)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	216.9***	**250.8*****	**-33.88*****		**317.7*****	**342.0*****	**-24.27*****		**423.5*****	**434.1*****	**-10.55***	
	(5.569)	**(5.555)**	**(7.671)**		**(5.359)**	**(4.030)**	**(7.012)**		**(4.361)**	**(3.902)**	**(5.760)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.8: Egypt detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.119	-1.889	-0.120	-1.177	-0.603	4.003	-0.607	4.905	-0.157	1.194	-0.158	0.315
	(0.597)	(7.652)	(0.624)	(6.698)	(0.499)	(5.206)	(0.402)	(6.242)	(0.381)	(3.838)	(0.390)	(4.472)
Upper-sec	-0.351	0.731	-0.378	0.418	-0.851*	3.781	-0.917***	3.647	-0.796	5.105*	-0.859***	3.761
	(0.333)	(4.135)	(0.271)	(3.874)	(0.515)	(2.429)	(0.278)	(3.176)	(0.507)	(2.746)	(0.333)	(2.867)
Post-sec not UNI	0.00654	-0.673	0.000372	-0.817	0.0179	1.164	0.00102	1.694	0.0246	2.329	0.00140	1.189
	(0.251)	(4.749)	(0.126)	(4.277)	(0.745)	(2.773)	(0.370)	(3.120)	(0.850)	(4.696)	(0.417)	(4.843)
University degree	-0.0120	-0.322	-0.0128	-0.369	0.203	1.661	0.216	1.859	0.583	2.418	0.621	2.286
	(0.495)	(4.285)	(0.521)	(3.872)	(0.401)	(2.074)	(0.430)	(2.358)	(0.476)	(2.482)	(0.473)	(2.874)
Native parents	-1.398	6.533	-1.779**	11.32	-2.295	22.78***	-2.921***	21.60**	-1.327	15.34*	-1.689***	13.8
	(1.333)	(16.02)	(0.757)	(19.82)	(2.075)	(8.730)	(0.519)	(9.775)	(1.222)	(7.825)	(0.367)	(9.346)
One bookcases	-0.249	2.713	-0.280	2.463	-0.338	1.053	-0.380	-0.19	-0.360	2.619	-0.405	1.595
	(0.199)	(2.998)	(0.218)	(2.737)	(0.230)	(3.297)	(0.244)	(3.134)	(0.335)	(3.393)	(0.258)	(3.049)
Two bookcases	-0.0226	0.442	-0.00992	0.898	-0.0190	-0.382	-0.00834	-0.289	0.109	1.366	0.0478	1.21
	(0.122)	(2.047)	(0.0676)	(2.060)	(0.187)	(1.616)	(0.0873)	(1.712)	(0.0960)	(1.576)	(0.0442)	(1.552)
Home possess H	0.529	-7.679	0.693	-5.262	0.799	-1.932	1.046	-1.262	0.609	0.303	0.797	-1.304
	(1.480)	(5.672)	(0.610)	(6.548)	(1.928)	(4.115)	(0.771)	(4.158)	(1.518)	(4.464)	(0.598)	(4.542)
Home possess M	-0.991	-13.54	-1.103*	-11.35	-1.334	-6.865	-1.484**	-2.782	-0.786	-2.204	-0.875*	-0.4
	(0.777)	(12.67)	(0.609)	(13.86)	(1.004)	(7.173)	(0.622)	(8.178)	(0.565)	(6.563)	(0.451)	(7.443)
TL spoken ALs	0.0541	12.19	0.0564	10.56	-0.516	11.42*	-0.538	11.1	-0.805	8.510	-0.840***	11.13
	(0.361)	(8.039)	(0.363)	(8.553)	(0.580)	(6.714)	(0.344)	(7.731)	(0.653)	(7.288)	(0.318)	(7.477)
PC at H&SCL	-1.601*	1.324	-1.522**	-0.809	-1.793*	-0.980	-1.704***	-1.845	0.129	3.442	0.123	2.514
	(0.862)	(4.196)	(0.699)	(4.881)	(0.962)	(3.252)	(0.637)	(3.572)	(0.434)	(3.223)	(0.414)	(3.268)
PC at H/SCL	2.666	2.216	2.543	0.531	2.305**	3.403	2.198***	0.469	1.380*	8.318	1.316*	4.857
	(1.667)	(12.08)	(1.552)	(13.13)	(0.986)	(9.082)	(0.820)	(9.467)	(0.812)	(9.492)	(0.692)	(10.60)
Male teacher	-0.117	7.558	-0.114	3.896	1.455	5.920	1.414	3.165	0.805	-2.345	0.783	-3.579
	(2.259)	(9.412)	(2.169)	(9.710)	(2.036)	(9.740)	(1.836)	(10.98)	(1.524)	(9.594)	(1.397)	(11.05)
T. Experience	-0.997	5.121	0.349	4.445	-0.809	-0.114	0.283	-2.565	0.0263	-2.750	-0.00922	-8.268
	(1.325)	(17.24)	(0.972)	(18.59)	(1.234)	(12.79)	(0.944)	(14.45)	(0.566)	(12.11)	(0.286)	(12.84)
T. Certificate!	0.207	16.68	0.801	15.28	0.0902	5.973	0.350	7.261	-0.0972	-13.12	-0.377	-14.89
	(0.830)	(13.91)	(0.641)	(12.98)	(0.550)	(8.582)	(0.424)	(9.065)	(1.133)	(10.60)	(0.742)	(10.97)
M SCL RCS	-0.0441	-4.099	-0.0333	-5.334	0.557	-19.47*	0.421	-23.16**	0.591	-19.79**	0.446	-21.84**
	(0.884)	(14.64)	(0.457)	(13.50)	(1.265)	(10.38)	(0.446)	(10.72)	(1.086)	(10.02)	(0.429)	(10.32)
L SCL RSC	0.0371	1.935	0.0668	2.152	-0.0916	0.631	-0.165	1.06	-0.0902	0.549	-0.163	0.791
	(0.186)	(2.638)	(0.228)	(2.407)	(0.803)	(1.522)	(0.188)	(1.996)	(0.548)	(1.192)	(0.167)	(1.373)
T. UNI Degree	4.608	54.38	5.658	50.85	5.534	46.30	6.795	57.82	-1.744	-42.05	-2.141	-47.01
	(31.25)	(289.0)	(38.28)	(172.3)	(30.42)	(280.9)	(37.27)	(353.3)	(7.870)	(73.00)	(9.656)	(80.35)
COMMU.>50000	0.964	-1.524	1.050	-0.675	0.789	-0.160	0.859	0.798	0.868	7.832	0.946	8.121
	(1.077)	(7.090)	(1.141)	(6.471)	(1.080)	(5.315)	(0.815)	(5.981)	(1.129)	(5.600)	(0.857)	(5.975)
Pov 50% Disadv	0.128	8.858	0.0601	11.93	0.198	11.26	0.0931	12.87	-0.345	14.55*	-0.163	16.77**
	(0.696)	(7.788)	(0.280)	(8.037)	(0.351)	(8.456)	(0.160)	(9.068)	(0.654)	(8.239)	(0.276)	(8.506)
Class size	-0.601	105.1	-0.635	185.6	-0.947	134.2	-1.001	274.9	1.747	-136.8	1.847	-31.38
	(3.383)	(169.8)	(2.976)	(168.9)	(3.632)	(228.5)	(3.356)	(280.6)	(4.612)	(149.0)	(3.665)	(138.7)
Class size sq	1.610	-70.19	1.646	-124.3	1.988	-83.53	2.033	-169.8	-0.631	61.62	-0.645	0.951
	(3.268)	(94.30)	(3.105)	(94.77)	(4.319)	(127.0)	(3.790)	(161.5)	(4.209)	(83.84)	(3.621)	(79.27)
Constant		-158.0		-181.5		-172.5		-235.0		83.50		62.06
		(356.5)		(224.8)		(343.2)		(447.9)		(129.9)		(115.3)
Total (Expl/Unexpl)	**-1.235**	**-16.14**	**-4.031**	**-15.16**	**-0.477**	**-13.89**	**-3.588**	**-13.82**	**0.237**	**-7.400**	**0.823**	**7.243**
	(18.90)	**(20.90)**	**(4.400)**	**(13.47)**	**(17.98)**	**(20.39)**	**(2.847)**	**(23.31)**	**(7.173)**	**(8.619)**	**(2.527)**	**(9.706)**
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap		Boys	Girls	Total Gap	
	248.7***	266.1***	-17.38*		384.8***	399.2***	-14.37*		517.0***	524.1***	-7.164	
	(7.345)	(7.242)	(9.133)		(5.288)	(6.077)	(7.599)		(5.725)	(4.614)	(7.788)	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.9: Algeria detailed decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.00503	0.986	0.0146	0.783	0.00327	-1.104	0.00948	-1.036	0.00493	-0.992	0.0143	-1.196
	(0.131)	(3.051)	(0.0257)	(3.117)	(0.0663)	(1.864)	(0.0171)	(1.904)	(0.139)	(2.135)	(0.0239)	(2.154)
Upper-sec	0.0396	1.470	0.0389	1.302	-0.125	-0.0414	-0.123	-0.174	-0.164	-0.103	-0.161	-0.350
	(0.411)	(2.065)	(0.404)	(2.135)	(0.309)	(2.005)	(0.303)	(1.977)	(0.257)	(2.175)	(0.258)	(2.127)
Post-sec not UNI	-0.0276	0.543	-0.0272	0.530	-0.179	-0.508	-0.176	-0.510	-0.197	0.213	-0.194	0.180
	(0.301)	(1.574)	(0.292)	(1.553)	(0.209)	(0.963)	(0.196)	(1.007)	(0.187)	(1.490)	(0.180)	(1.531)
University degree	-0.123	1.100	-0.119	1.241	-0.0582	0.861	-0.0564	0.955	0.0282	0.439	0.0273	0.487
	(0.259)	(2.142)	(0.247)	(2.036)	(0.174)	(1.323)	(0.168)	(1.306)	(0.239)	(2.069)	(0.230)	(1.958)
One bookcases	-0.362	0.296	-0.367	-0.0466	-0.392*	0.917	-0.398*	0.687	-0.427	2.179	-0.433	1.989
	(0.270)	(1.330)	(0.270)	(1.430)	(0.226)	(0.924)	(0.219)	(0.924)	(0.371)	(1.837)	(0.374)	(1.755)
Two bookcases	0.0223	0.176	0.0245	0.0247	-0.0366	-0.163	-0.0401	-0.269	-0.0882	-0.0908	-0.0966	-0.362
	(0.0653)	(1.011)	(0.0691)	(0.968)	(0.0627)	(0.681)	(0.0669)	(0.689)	(0.131)	(0.891)	(0.0797)	(0.865)
Home possess H	0.0636	-0.996	0.00603	0.346	0.0726	-1.472	0.00688	-0.660	0.0657	-3.984	0.00622	-3.823
	(0.199)	(4.517)	(0.0392)	(4.423)	(0.304)	(2.808)	(0.0620)	(3.053)	(0.285)	(3.118)	(0.0597)	(3.344)
Home possess M	-0.198	3.782	-0.170	5.147	-0.336	0.539	-0.288**	1.555	-0.307	1.658	-0.263*	3.057
	(0.244)	(5.402)	(0.195)	(5.561)	(0.245)	(3.834)	(0.136)	(3.942)	(0.226)	(4.330)	(0.139)	(4.397)
TL spoken ALs	0.0254	0.794	0.0246	0.111	0.0221	-0.0464	0.0213	-0.397	0.0882	-2.924	0.0853	-3.052
	(0.227)	(3.546)	(0.217)	(3.055)	(0.144)	(2.660)	(0.139)	(2.513)	(0.186)	(2.797)	(0.167)	(2.746)
PC at H&SCL	-0.625	0.994	-0.665**	0.883	-0.472	0.779	-0.502*	0.629	-0.208	0.112	-0.221	-0.0256
	(0.454)	(1.116)	(0.336)	(1.064)	(0.311)	(0.869)	(0.275)	(0.842)	(0.385)	(1.354)	(0.412)	(1.386)
PC at H/SCL	-0.0322	0.904	-0.00660	0.673	-0.00995	-0.717	-0.00204	-0.840	-0.0167	2.628	-0.00342	2.613
	(0.122)	(2.691)	(0.0276)	(2.633)	(0.0810)	(1.959)	(0.0178)	(1.875)	(0.122)	(2.906)	(0.0264)	(2.951)
Male teacher	0.0802	0.0628	0.0912	-0.0652	0.0938	-0.584	0.107	-0.417	0.152	-0.242	0.173	-0.244
	(0.143)	(4.231)	(0.158)	(3.932)	(0.196)	(3.728)	(0.195)	(4.107)	(0.238)	(4.976)	(0.224)	(4.767)
T. Experience	-0.0199	4.624	-0.000167	4.377	-0.00730	-3.601	-6.15e-05	-2.246	-0.0193	3.869	-0.000162	3.674
	(0.205)	(10.03)	(0.0707)	(10.59)	(0.0559)	(5.438)	(0.0163)	(6.179)	(0.0554)	(6.896)	(0.0184)	(6.669)
T. Certificate!	0.0415	-3.773	0.0316	-4.366	0.0333	-3.683	0.0254	-4.622	0.0484	-4.832	0.0369	-5.164
	(0.0952)	(5.624)	(0.0478)	(5.459)	(0.107)	(3.584)	(0.0477)	(3.588)	(0.131)	(4.502)	(0.0577)	(4.902)
M SCL RCS	0.00745	-0.460	0.00810	0.962	0.00645	-1.865	0.00701	-2.155	0.0260	-4.859	0.0283	-7.194
	(0.126)	(12.89)	(0.103)	(13.00)	(0.0528)	(5.632)	(0.0569)	(5.701)	(0.0572)	(9.017)	(0.0644)	(9.050)
L SCL RSC	-0.00481	0.315	-0.00674	0.237	0.00412	0.524	0.00577	0.356	0.0421	0.843	0.0590	0.228
	(0.0665)	(1.618)	(0.0956)	(1.511)	(0.0407)	(1.052)	(0.0714)	(1.103)	(0.0543)	(1.368)	(0.0829)	(1.371)
T. UNI Degree	-0.0621	1.000	-0.0719	0.831	-0.0337	0.418	-0.0390	0.422	0.000757	0.453	0.000877	0.491
	(0.0786)	(1.495)	(0.0549)	(1.246)	(0.0719)	(1.062)	(0.0731)	(1.070)	(0.0560)	(1.662)	(0.0566)	(1.652)
COMMU.>50000	-0.0609	-3.812	-0.0698	-4.108	-0.0369	-1.965	-0.0423	-2.073	-0.0838	-1.588	-0.0960	-2.490
	(0.0951)	(3.697)	(0.0784)	(3.963)	(0.0781)	(2.191)	(0.0735)	(2.627)	(0.125)	(3.365)	(0.0829)	(3.668)
Pov 50% Disadv	-0.0595	-3.405	-0.0549	-3.678	-0.00125	0.725	-0.00115	0.280	0.0117	1.121	0.0108	0.804
	(0.148)	(3.829)	(0.0751)	(3.647)	(0.0514)	(2.897)	(0.0441)	(2.938)	(0.0516)	(3.432)	(0.0440)	(3.549)
Class size	1.108	-26.38	1.041	-37.25	1.129	-39.52	1.061	-50.26	1.214	-43.44	1.141	-48.52
	(1.056)	(77.27)	(0.856)	(67.86)	(0.876)	(63.51)	(0.765)	(61.34)	(1.210)	(61.99)	(0.925)	(63.05)
Class size sq	-0.322	11.94	-0.298	19.80	-0.368	25.07	-0.340	31.70	-0.393	18.61	-0.364	21.07
	(0.446)	(47.29)	(0.353)	(43.73)	(0.364)	(38.18)	(0.345)	(36.89)	(0.664)	(40.02)	(0.512)	(41.13)
Constant		19.08		21.50		36.65		39.88		40.74		47.96
		(47.58)		(43.96)		(34.31)		(34.12)		(29.48)		(29.51)
Total (Expl/Unexpl)	**-1.614***	**8.151*****	**-1.258****	**7.855****	**-1.483****	**8.136*****	**-1.523*****	**7.894*****	**-0.873**	**5.685***	**-1.128**	**5.703***
	(0.908)	**(3.162)**	**(0.616)**	**(3.169)**	**(0.693)**	**(2.367)**	**(0.477)**	**(2.442)**	**(0.994)**	**(3.100)**	**(0.782)**	**(3.140)**
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap		Boys	Girls	Total Gap	
	314.0	**307.5**	**6.537****		**389.6**	**382.9**	**6.653*****		466.7	461.9	**4.812***	
	(3.323)	**(3.221)**	**(3.156)**		**(2.819)**	**(2.819)**	**(2.396)**		(2.454)	(2.582)	**(2.849)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (parents nationality not included in Algeria, Native parents) Dummy controls for missing observations included.

Table B-5.10: Syria detailed decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.0661	1.789	0.0717	3.415	-0.0108	0.792	-0.0117	3.019	0.0177	1.915	0.0193	3.028
	(0.221)	(4.302)	(0.188)	(5.763)	(0.138)	(3.165)	(0.147)	(3.309)	(0.176)	(3.869)	(0.178)	(4.215)
Upper-sec	0.322	3.207	0.157	5.330	0.282	0.515	0.137	2.121	0.542	1.510	0.263	2.621
	(0.423)	(2.772)	(0.213)	(5.702)	(0.398)	(2.491)	(0.200)	(3.055)	(0.549)	(2.806)	(0.271)	(3.523)
Post-sec not UNI	0.0446	5.405	0.0171	8.877	0.276	1.767	0.106	3.333	0.236	3.307	0.0908	4.899
	(0.243)	(4.603)	(0.0961)	(6.997)	(0.293)	(3.484)	(0.173)	(3.998)	(0.329)	(3.855)	(0.185)	(4.591)
University degree	0.00146	0.925	-0.0103	1.407	0.00349	-0.445	-0.0247	0.136	0.00330	0.0461	-0.0233	0.341
	(0.294)	(2.408)	(0.169)	(3.106)	(0.392)	(1.956)	(0.243)	(2.551)	(0.338)	(2.399)	(0.211)	(2.919)
Native parents	-1.084	7.575	-1.073	12.60	-0.335	14.90*	-0.332	12.41	-0.309	5.539	-0.306	3.757
	(0.773)	(13.56)	(0.727)	(20.43)	(0.479)	(8.691)	(0.477)	(10.36)	(0.426)	(10.36)	(0.410)	(8.876)
One bookcases	-0.119	-0.784	-0.209	-0.280	-0.0768	-0.105	-0.134	0.357	-0.0858	-0.616	-0.150	1.422
	(0.136)	(2.224)	(0.145)	(3.309)	(0.193)	(2.010)	(0.181)	(2.252)	(0.125)	(3.167)	(0.202)	(3.193)
Two bookcases	0.0596	0.434	0.143	0.569	0.00515	0.323	0.0123	0.971	-0.0769	0.297	-0.184	0.737
	(0.138)	(1.847)	(0.151)	(2.603)	(0.0549)	(1.252)	(0.118)	(1.474)	(0.139)	(2.214)	(0.149)	(2.474)
Home possess H	-1.322	4.933	-1.804**	6.860	-2.041	0.179	-2.785***	-0.941	-1.587	-0.0617	-2.165**	-4.951
	(0.900)	(5.238)	(0.754)	(7.403)	(1.507)	(4.782)	(0.945)	(5.462)	(1.274)	(6.476)	(0.977)	(7.632)
Home possess M	0.362	6.889	0.579*	8.298	0.418	2.399	0.669*	-0.0967	0.292	-0.0279	0.467*	-2.833
	(0.316)	(8.415)	(0.314)	(11.01)	(0.628)	(6.986)	(0.401)	(8.515)	(0.348)	(7.922)	(0.256)	(7.444)
TL spoken ALs	0.266	6.451	0.317	3.473	-0.129	3.678	-0.154	0.742	-0.0181	-0.765	-0.0215	-1.525
	(0.469)	(13.99)	(0.462)	(17.48)	(0.246)	(6.386)	(0.308)	(7.969)	(0.420)	(9.427)	(0.507)	(9.071)
PC at H&SCL	0.201	-1.882	0.271	-3.361	0.236	-2.452	0.318	-3.683	0.0893	-1.192	0.120	-0.470
	(0.655)	(5.703)	(0.456)	(7.793)	(0.520)	(4.915)	(0.326)	(5.431)	(0.358)	(5.528)	(0.373)	(5.645)
PC at H/SCL	0.441	-6.140	0.296	-11.17*	0.413	-6.362	0.277	-7.250	0.259	-1.453	0.174	-0.404
	(0.723)	(6.073)	(0.489)	(6.733)	(0.429)	(4.641)	(0.297)	(4.814)	(0.626)	(6.856)	(0.416)	(7.300)
Male teacher	-3.192	10.13	-3.483	8.074	-1.443	8.025	-1.575	5.919	0.411	7.630	0.448	7.195
	(2.102)	(8.587)	(2.219)	(9.386)	(1.876)	(7.698)	(2.070)	(7.625)	(2.752)	(8.347)	(2.964)	(7.072)
T. Experience	-0.920	-11.83	-1.362	-9.098	-1.032	-9.693	-1.528	-5.918	-0.790	-11.92	-1.170	-9.659
	(0.953)	(12.40)	(1.302)	(16.01)	(1.963)	(11.96)	(1.377)	(13.98)	(1.240)	(9.906)	(1.272)	(10.22)
T. Certificate!	0.212	-1.685	-0.0571	-7.266	0.110	-8.371	-0.0296	-7.279	0.0207	-0.897	-0.00558	0.630
	(0.420)	(16.11)	(0.109)	(19.07)	(0.476)	(14.48)	(0.143)	(15.04)	(0.257)	(15.02)	(0.0800)	(16.59)
M SCL RCS	-0.00520	-6.758	0.00582	-12.38	0.0864	-7.978	-0.0967	-20.10	0.163	-21.73	-0.182	-35.48
	(1.103)	(25.82)	(1.009)	(28.05)	(0.725)	(22.95)	(0.690)	(28.41)	(1.190)	(20.25)	(1.048)	(22.35)
L SCL RSC	1.376	-3.902	1.759	-3.387	2.443	-1.981	3.124	-2.298	2.389	-3.138	3.055	-4.144
	(3.561)	(6.090)	(3.361)	(8.197)	(3.065)	(4.266)	(3.143)	(5.797)	(2.520)	(3.471)	(3.159)	(3.530)
T. UNI Degree	0.796	4.572	1.080	3.553	0.465	2.960	0.631	3.023	-0.0940	1.862	-0.128	0.916
	(1.261)	(9.314)	(1.467)	(9.826)	(0.880)	(6.400)	(0.996)	(7.286)	(0.968)	(7.519)	(1.276)	(7.287)
COMMU.>50000	-0.623	1.881	-1.054	0.350	0.465	1.438	0.787	2.006	1.250	3.537	2.116	5.750
	(0.988)	(7.693)	(1.317)	(9.180)	(0.917)	(5.211)	(1.067)	(6.146)	(1.559)	(6.506)	(1.452)	(7.191)
Pov 50% Disadv	-0.881	-11.76	-0.994	-6.772	-1.042	-14.83*	-1.176	-9.405	-1.835	-12.23	-2.070	-6.366
	(1.501)	(9.122)	(1.532)	(14.01)	(1.200)	(8.288)	(1.333)	(10.41)	(1.575)	(7.818)	(1.604)	(9.062)
Class size	4.104	-21.80	6.848	20.80	6.288	53.47	10.49	104.8	8.530	128.9	14.23	165.7
	(9.692)	(199.3)	(14.26)	(205.3)	(13.51)	(225.9)	(17.12)	(232.2)	(14.55)	(247.1)	(19.40)	(239.3)
Class size sq	-2.006	9.545	-4.249	-18.66	-3.809	-28.55	-8.067	-66.26	-6.204	-87.41	-13.14	-119.7
	(6.567)	(113.5)	(13.88)	(115.8)	(9.737)	(125.2)	(16.48)	(129.8)	(10.78)	(139.6)	(18.72)	(143.1)
Constant		16.05		-0.0809		11.09		4.61		4.382		6.999
		(107.9)		(130.9)		(128.1)		(134.6)		(129.7)		(119.0)
Total (Expl/Unexpl)	**-3.606**	**14.27**	**-5.520**	**15.12**	**0.178**	**20.55*** **	**-2.137**	**19.81** **	**2.005**	**16.22** **	**-0.0703**	**15.63** **
	(6.640)	**(9.915)**	**(5.213)**	**(11.09)**	**(6.259)**	**(7.899)**	**(3.626)**	**(8.889)**	**(5.068)**	**(6.571)**	**(3.303)**	**(6.570)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	296.6	**285.9**	**10.67**		**405.7**	**385.0**	**20.73*** **		**510.8**	**492.6**	**18.22*** **	
	(6.700)	**(6.494)**	**(7.993)**		**(5.767)**	**(4.977)**	**(6.812)**		**(5.520)**	**(5.169)**	**(5.975)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.11: Tunisia detailed decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.357	1.706	0.343	1.553	0.366	1.576	0.352	1.620	0.447	0.0712	0.430	-0.0238
	(0.406)	(4.185)	(0.359)	(4.039)	(0.303)	(2.793)	(0.254)	(2.902)	(0.480)	(3.787)	(0.332)	(3.646)
Upper-sec	0.0946	1.208	0.0892	1.336	0.129	2.641	0.121	2.816	0.252	3.222	0.237	3.088
	(0.188)	(3.884)	(0.137)	(3.834)	(0.155)	(3.513)	(0.120)	(3.472)	(0.399)	(4.141)	(0.169)	(4.017)
Post-sec not UNI	0.00897	-0.167	0.00768	-0.516	0.0212	-0.883	0.0181	-0.500	0.0142	-1.382	0.0122	-1.269
	(0.0777)	(3.437)	(0.0409)	(3.434)	(0.0775)	(2.028)	(0.0294)	(2.030)	(0.163)	(3.112)	(0.0685)	(3.026)
University degree	0.0813	0.448	0.0751	0.268	0.118	-0.0768	0.109	0.0463	0.405	0.358	0.374	0.713
	(0.241)	(3.913)	(0.207)	(3.917)	(0.190)	(1.540)	(0.137)	(1.508)	(0.400)	(4.741)	(0.359)	(4.529)
Native parents	-0.497	17.38	-0.492	17.02	-0.398	14.87	-0.394	13.62	-0.603	-1.978	-0.598**	-2.908
	(0.504)	(17.65)	(0.388)	(17.37)	(0.382)	(10.22)	(0.314)	(10.09)	(0.387)	(10.77)	(0.286)	(11.46)
One bookcases	-0.193	0.405	-0.183	0.457	-0.375	0.540	-0.355**	0.348	-0.500	2.371	-0.474***	1.908
	(0.223)	(1.777)	(0.170)	(1.787)	(0.237)	(2.561)	(0.149)	(2.595)	(0.317)	(2.619)	(0.161)	(2.645)
Two bookcases	0.106	-0.667	0.102	-0.635	0.287	-0.237	0.276***	-0.397	0.870	-2.694	0.839***	-2.706
	(0.147)	(0.921)	(0.0910)	(0.962)	(0.269)	(1.211)	(0.0864)	(1.251)	(0.797)	(1.820)	(0.221)	(1.816)
Home possess H	0.939	-4.998	0.983***	-6.464	1.064	-4.847	1.114***	-5.215	0.868	-4.856	0.909***	-4.742
	(0.694)	(7.414)	(0.356)	(8.832)	(0.803)	(4.286)	(0.279)	(4.488)	(0.706)	(4.557)	(0.293)	(4.581)
Home possess M	-0.735	-8.357	-0.764*	-9.850	-0.844*	-6.240	-0.877***	-6.254	-0.548	-5.111	-0.570***	-4.915
	(0.626)	(7.692)	(0.414)	(8.281)	(0.474)	(4.722)	(0.306)	(4.733)	(0.387)	(3.438)	(0.196)	(3.348)
TL spoken ALs	-0.128	-0.628	-0.125	-0.459	-0.188	0.144	-0.183*	0.118	-0.262	-0.0368	-0.255***	0.00801
	(0.189)	(1.375)	(0.150)	(1.421)	(0.195)	(1.100)	(0.102)	(1.059)	(0.208)	(0.817)	(0.0898)	(0.788)
PC at H&SCL	-0.366	0.290	-0.389	0.307	-0.270*	-0.344	-0.287*	-0.330	-0.231	0.414	-0.245*	0.469
	(0.253)	(1.148)	(0.239)	(1.130)	(0.161)	(0.803)	(0.158)	(0.813)	(0.171)	(0.582)	(0.127)	(0.574)
PC at H/SCL	-0.361	-1.258	-0.359	-0.735	-0.193	-2.052	-0.192	-1.893	-0.240	3.012	-0.239	3.060
	(0.391)	(7.417)	(0.252)	(7.202)	(0.280)	(3.520)	(0.163)	(3.551)	(0.205)	(3.389)	(0.150)	(3.785)
Male teacher	0.00475	2.002	0.00611	1.367	0.00471	1.073	0.00607	0.426	0.00339	3.448	0.00437	3.722
	(0.134)	(4.862)	(0.0382)	(4.954)	(0.204)	(4.512)	(0.0582)	(4.478)	(0.0806)	(5.868)	(0.0243)	(5.987)
T. Experience	-0.159	-1.813	-0.148	-2.534	-0.212	-1.208	-0.197*	-1.004	-0.0610	4.398	-0.0569	5.983
	(0.247)	(9.202)	(0.188)	(9.509)	(0.294)	(3.667)	(0.115)	(3.374)	(0.248)	(6.898)	(0.165)	(6.710)
T. Certificate!	-0.0505	-5.183	-0.0411	-6.440	-0.0192	1.010	-0.0156	0.537	0.0161	-2.503	0.0131	-1.069
	(0.0823)	(6.822)	(0.0390)	(7.689)	(0.0458)	(10.02)	(0.0454)	(9.714)	(0.100)	(12.30)	(0.0632)	(12.34)
M SCL RCS	-0.00983	5.663	-0.00484	6.493	-0.00787	-0.469	-0.00388	0.284	0.0124	-0.981	0.00610	-0.891
	(0.110)	(8.457)	(0.0459)	(9.019)	(0.0512)	(11.32)	(0.0190)	(11.23)	(0.180)	(13.03)	(0.0706)	(12.66)
L SCL RSC	0.0599	-0.0420	0.0473	-0.00500	-0.000736	-1.575	-0.000580	-1.579	-0.0361	1.509	-0.0284	1.098
	(0.173)	(3.328)	(0.113)	(3.564)	(0.134)	(3.347)	(0.108)	(3.297)	(0.215)	(3.986)	(0.151)	(3.915)
T. UNI Degree	0.0978	19.15	0.0935	17.93	0.0273	-3.000	0.0261	1.210	-0.0574	-16.00	-0.0549	-11.16
	(0.127)	(18.84)	(0.0656)	(18.57)	(0.0939)	(22.86)	(0.0795)	(23.22)	(0.149)	(39.04)	(0.142)	(38.93)
COMMU.>50000	0.00520	0.291	0.00414	0.695	0.0131	-0.265	0.0104	-0.225	-0.0309	1.204	-0.0246	0.911
	(0.110)	(2.048)	(0.0789)	(2.342)	(0.0711)	(1.687)	(0.0526)	(1.602)	(0.121)	(2.819)	(0.0678)	(2.839)
Pov 50% Disadv	-0.0487	-2.425	-0.0456	-2.464	-0.0654	-2.163	-0.0612	-1.866	-0.0698	5.167	-0.0654	5.588
	(0.153)	(5.328)	(0.0608)	(5.672)	(0.146)	(4.494)	(0.0616)	(4.529)	(0.114)	(5.632)	(0.0597)	(5.523)
Class size	0.269	-115.7**	0.290	-146.4**	0.651	-52.13	0.700	-57.32	0.983	24.11	1.057	28.11
	(0.807)	(52.05)	(0.619)	(70.56)	(1.484)	(116.1)	(0.523)	(113.1)	(1.344)	(89.41)	(0.658)	(79.72)
Class size sq	-0.654	61.95*	-0.718	80.04*	-1.173	29.27	-1.287**	33.09	-1.490	-8.042	-1.635*	-7.546
	(0.980)	(32.40)	(0.786)	(42.51)	(1.429)	(64.47)	(0.656)	(63.62)	(1.349)	(47.32)	(0.837)	(43.12)
Constant		64.47*		85.34*		49.21		47.7		7.250		-4.287
		(38.90)		(50.54)		(61.00)		(58.91)		(72.07)		(69.51)
Total (Expl/Unexpl)	**-2.214***	**25.67*****	**-1.383****	**26.06*****	**-1.665**	**24.18*****	**-1.193****	**24.21*****	**-0.680**	**16.06*****	**-0.207**	**16.52*****
	(1.257)	**(4.212)**	**(0.601)**	**(4.465)**	**(1.452)**	**(3.727)**	**(0.570)**	**(3.640)**	**(1.779)**	**(4.322)**	**(0.782)**	**(4.259)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	349.5	**326.1**	**23.46*****		**429.7**	**407.1**	**22.52*****		**515.3**	**499.9**	**15.38*****	
	(4.498)	**(3.338)**	**(4.150)**		**(3.169)**	**(3.189)**	**(3.833)**		**(4.277)**	**(3.814)**	**(4.808)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.12: Turkey detailed decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.0349	1.626	0.0265	6.357	-0.307	-7.242	-0.233*	-7.517	-0.229	-2.051	-0.174	-2.877
	(0.172)	(9.653)	(0.128)	(11.73)	(0.247)	(7.612)	(0.131)	(9.241)	(0.232)	(5.323)	(0.119)	(5.752)
Upper-sec	-0.394	0.654	-0.380	2.960	-1.186*	-0.125	-1.143***	-0.633	-0.812	-0.779	-0.783*	-1.953
	(0.443)	(4.297)	(0.357)	(5.017)	(0.608)	(3.389)	(0.396)	(4.000)	(0.540)	(3.471)	(0.414)	(3.484)
Post-sec not UNI	0.0228	-0.258	0.0208	0.151	0.0501	0.0733	0.0457	-0.118	0.0945	-2.258	0.0862	-2.314
	(0.186)	(0.864)	(0.0497)	(0.899)	(0.212)	(1.036)	(0.0603)	(0.943)	(0.591)	(1.792)	(0.154)	(1.861)
University degree	-0.0779	-1.141	-0.0697	-0.186	-0.334	-1.348	-0.299*	-1.241	-0.869	0.121	-0.778*	-0.417
	(0.228)	(1.638)	(0.0846)	(1.788)	(0.534)	(1.403)	(0.178)	(1.483)	(1.380)	(3.671)	(0.442)	(3.844)
Native parents	-0.416	46.61	-0.447	47.99	-0.116	44.00	-0.124	35.54	-0.131	9.109	-0.141	8.939
	(0.383)	(42.32)	(0.410)	(44.36)	(0.242)	(29.89)	(0.186)	(34.51)	(0.219)	(26.17)	(0.200)	(27.84)
One bookcases	-0.367	0.239	-0.405	0.0205	-0.927*	0.213	-1.024***	0.911	-0.656	4.358	-0.725*	4.481
	(0.292)	(2.841)	(0.298)	(2.818)	(0.524)	(2.301)	(0.351)	(2.281)	(0.420)	(3.279)	(0.429)	(3.667)
Two bookcases	-0.170	1.226	-0.166	1.076	-1.053	1.376	-1.030*	1.625	-1.375	4.933*	-1.345	3.464
	(0.591)	(1.860)	(0.577)	(2.046)	(0.703)	(1.682)	(0.619)	(1.511)	(1.041)	(2.868)	(0.992)	(3.424)
Home possess H	1.320	-10.76	1.440*	-10.39	1.033	-5.508	1.127**	-5.173	0.339	-6.387	0.370	-1.769
	(1.481)	(11.40)	(0.739)	(12.38)	(0.934)	(6.921)	(0.441)	(6.667)	(0.454)	(8.138)	(0.425)	(9.057)
Home possess M	-1.646	-18.41	-1.648*	-15.79	-0.721	-0.839	-0.721*	-0.236	0.322	4.523	0.323	7.966
	(1.581)	(17.04)	(0.895)	(17.77)	(0.587)	(8.090)	(0.398)	(7.592)	(0.316)	(6.163)	(0.290)	(6.835)
TL spoken ALs	-3.807***	-22.76	-3.630***	-16.60	-2.940***	-2.792	-2.803***	-3.388	-1.839**	-15.79	-1.754**	-17.16
	(1.434)	(14.45)	(1.131)	(16.13)	(0.929)	(8.895)	(0.715)	(9.553)	(0.857)	(11.48)	(0.705)	(13.27)
PC at H&SCL	-0.00572	-4.363	0.192	-3.476	-0.00664	-2.299	0.223	-1.401	-0.00291	12.01*	0.0979	9.263
	(0.682)	(8.178)	(0.261)	(8.198)	(0.549)	(4.917)	(0.201)	(4.986)	(0.298)	(6.289)	(0.144)	(5.908)
PC at H/SCL	-1.332	-7.699	-1.319	-5.855	-1.004	-2.708	-0.994*	-0.314	0.388	10.26	0.384	6.681
	(1.580)	(13.38)	(1.529)	(13.24)	(0.683)	(7.661)	(0.598)	(7.911)	(0.720)	(7.506)	(0.764)	(7.190)
Male teacher	-0.306	-0.338	-0.309	1.253	-0.238	0.377	-0.240	0.945	-0.0582	-10.47	-0.0586	-11.73
	(0.427)	(9.385)	(0.346)	(9.439)	(0.343)	(6.014)	(0.256)	(5.748)	(0.314)	(10.14)	(0.295)	(9.843)
T. Experience	-0.0464	-0.334	-0.0311	1.013	-0.280	-3.734	-0.188	-4.509	-0.337	-5.234	-0.226	-4.537
	(0.456)	(18.83)	(0.283)	(21.62)	(0.477)	(11.20)	(0.252)	(11.47)	(0.461)	(15.25)	(0.248)	(14.29)
T. Certificate!	-0.0787	-74.63	-0.0322	-65.59	-0.0521	-16.60	-0.0213	-8.218	-0.0382	-0.0529	-0.0156	-4.512
	(0.0724)	(84.58)	(0.0297)	(101.3)	(0.0909)	(68.10)	(0.0371)	(62.23)	(0.0367)	(23.29)	(0.0149)	(23.94)
M SCL RCS	0.0211	3.635	0.125	1.318	0.0269	-7.405	0.159	-9.882	0.0111	6.788	0.0657	6.291
	(0.238)	(11.23)	(0.150)	(12.73)	(0.604)	(13.88)	(0.292)	(15.36)	(0.382)	(28.56)	(0.263)	(25.28)
L SCL RSC	-0.270	0.581	-0.346	-1.270	-0.270	-1.994	-0.347	-3.198	-0.124	6.114	-0.160	6.851
	(0.419)	(6.525)	(0.303)	(7.600)	(0.609)	(4.782)	(0.347)	(5.135)	(0.471)	(10.71)	(0.408)	(9.888)
T. UNI Degree	-0.0551	7.209	-0.0458	7.352	0.492	-9.203	0.410	-8.110	0.341	-27.95	0.284	-24.46
	(0.805)	(25.40)	(0.636)	(29.88)	(0.556)	(15.15)	(0.436)	(15.10)	(0.597)	(25.16)	(0.474)	(23.78)
COMMU.>50000	-0.00194	14.35	0.00153	11.41	-0.00254	4.754	0.00201	4.600	-0.0107	-0.857	0.00844	-0.234
	(0.0760)	(12.00)	(0.0281)	(13.06)	(0.147)	(6.993)	(0.0584)	(8.216)	(0.444)	(10.60)	(0.178)	(10.95)
Pov 50% Disadv	-0.451	1.697	-0.378	2.254	-0.961*	3.645	-0.806**	1.588	-1.413*	-9.290	-1.185**	-10.65
	(0.462)	(9.824)	(0.363)	(10.83)	(0.578)	(8.105)	(0.373)	(8.243)	(0.765)	(12.68)	(0.493)	(12.53)
Class size	-0.728	-88.07	-0.867	-76.14	-0.682	7.527	-0.813	26.33	1.165	-105.7	1.387	-112.4
	(1.224)	(87.49)	(1.212)	(92.88)	(1.120)	(85.36)	(0.983)	(74.12)	(1.264)	(110.0)	(1.273)	(100.0)
Class size sq	0.668	36.82	0.863	33.82	0.729	-0.194	0.942	-6.971	-0.604	60.75	-0.781	63.72
	(1.025)	(37.64)	(1.074)	(39.01)	(0.982)	(38.20)	(0.909)	(33.75)	(0.941)	(49.80)	(1.149)	(45.54)
Constant		123.9		86.75		10.67		-2.557		86.91		98.57
		(85.88)		(98.18)		(91.12)		(87.98)		(101.7)		(99.55)
Total (Expl/Unexpl)	**-9.363*** **	**7.173**	**-7.400*** **	**6.312**	**-9.326*** **	**9.272** **	**-7.880*** **	**8.171***	**-5.947***	**12.29***	**-5.361*** **	**13.61***
	(3.023)	**(7.664)**	**(1.799)**	**(8.227)**	**(2.634)**	**(4.231)**	**(1.474)**	**(4.280)**	**(3.082)**	**(7.202)**	**(1.724)**	**(7.051)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	295.9* **	**298.1*** **	**-2.190**		**424.3*** **	**424.3*** **	**0.0535**		**584.1*** **	**577.7*** **	**-6.344**	
	(4.821)	**(7.729)**	**(6.928)**		**(5.205)**	**(6.057)**	**(4.704)**		**(8.536)**	**(7.330)**	**(7.251)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.13: Iran decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.0521	-5.153	-0.0905	-2.584	-0.0899	-2.436	-0.156	-10.33	-0.00125	-0.798	-0.00218	-2.899
	(0.231)	(5.398)	(0.325)	(9.737)	(0.159)	(3.096)	(0.218)	(11.45)	(0.102)	(3.312)	(0.161)	(5.996)
Upper-sec	-0.295	-0.833	-0.643	-5.256	-0.773	0.123	-1.687*	-2.911	0.140	5.323*	0.306	2.136
	(0.703)	(3.256)	(1.406)	(6.765)	(0.634)	(1.857)	(0.897)	(6.755)	(0.432)	(2.810)	(0.912)	(11.79)
Post-sec not UNI	0.241	-0.964	1.827	-0.794	0.478	-1.458	3.617	0.529	-0.0935	4.709*	-0.707	5.136
	(0.502)	(1.919)	(3.284)	(4.179)	(0.713)	(2.155)	(4.382)	(3.110)	(0.328)	(2.745)	(2.374)	(10.41)
University degree	-0.0290	-0.897	-0.237	-4.502	-0.246	-1.774	-2.007*	-0.690	-0.344	3.039	-2.815	8.761
	(0.470)	(2.229)	(1.148)	(4.773)	(0.743)	(1.718)	(1.173)	(3.178)	(1.411)	(3.072)	(2.318)	(10.41)
Native parents	-0.0885	36.28	-0.106	-44.50	0.175	47.06**	0.210	-10.67	-0.303	6.567	-0.363	-6.334
	(0.447)	(31.14)	(0.663)	(99.62)	(0.238)	(21.76)	(0.292)	(37.09)	(0.290)	(18.83)	(0.475)	(31.59)
One bookcases	0.0540	-1.957	0.671	2.391	0.0810	0.482	1.005	4.619	0.0902	3.287	1.120	-2.518
	(0.247)	(1.739)	(1.139)	(5.494)	(0.374)	(1.988)	(1.626)	(7.908)	(0.518)	(3.191)	(2.313)	(8.798)
Two bookcases	-0.247	-1.871	-0.773	2.474	-0.436	-1.379	-1.364	-2.166	-0.734	-1.869	-2.299	-7.654
	(0.239)	(1.589)	(0.669)	(5.117)	(0.415)	(1.613)	(0.865)	(3.303)	(0.715)	(2.667)	(1.546)	(6.784)
Home possess H	-0.00631	1.958	-0.0270	-28.12	0.0360	2.952	0.154	-1.579	0.0119	9.187	0.0510	18.19
	(0.425)	(5.404)	(2.157)	(23.55)	(0.116)	(6.311)	(0.400)	(13.50)	(0.218)	(7.513)	(0.848)	(39.56)
Home possess M	-0.210	3.797	-0.527	8.978	-0.0637	5.144	-0.160	13.59	0.0734	6.433	0.185	22.72
	(0.363)	(5.411)	(0.843)	(10.59)	(0.273)	(3.988)	(0.687)	(11.73)	(0.267)	(4.633)	(0.677)	(25.30)
TL spoken ALs	-1.403	1.849	-0.999	18.04	-1.747	-0.796	-1.244	0.879	-1.730	-7.914	-1.232	-8.105
	(0.976)	(6.582)	(0.752)	(13.68)	(1.352)	(6.043)	(2.276)	(9.125)	(1.228)	(7.571)	(2.014)	(15.37)
PC at H&SCL	-0.258	-0.0939	-0.385	4.020*	-0.275	0.523	-0.411	0.375	-1.922	-2.506	-2.876	-5.470
	(0.287)	(0.829)	(0.455)	(2.388)	(0.450)	(1.460)	(0.735)	(1.198)	(4.182)	(4.327)	(6.252)	(18.59)
PC at H/SCL	0.284	-1.625	1.125	27.64	0.160	1.453	0.635	11.46	0.414	-6.694	1.639	7.472
	(0.615)	(4.939)	(2.050)	(20.23)	(0.372)	(5.622)	(1.230)	(18.14)	(0.893)	(5.968)	(2.935)	(10.40)
Male teacher	-22.50*	34.98	-22.76*	13.17	-23.16	26.91	-23.43	26.51	-18.23	31.60	-18.44	94.45*
	(11.92)	(61.21)	(11.86)	(64.47)	(14.56)	(47.03)	(14.75)	(46.56)	(19.23)	(47.78)	(19.53)	(54.03)
T. Experience	0.656	-1.212	-0.146	0.248	0.760	-4.604	-0.169	2.451	2.607	-28.62	-0.579	-15.33
	(1.781)	(18.73)	(3.366)	(30.11)	(1.543)	(14.74)	(2.318)	(28.28)	(2.420)	(19.27)	(3.854)	(50.81)
T. Certificate!												
M SCL RCS	-0.0789	-10.44	-0.542	-24.22	-0.192	-7.856	-1.318	7.468	-0.0956	-25.79	-0.657	42.69
	(0.321)	(11.60)	(1.340)	(24.70)	(0.617)	(12.79)	(1.986)	(16.78)	(0.664)	(30.86)	(3.358)	(42.56)
L SCL RSC	0.00176	-8.402**	0.0635	-16.46*	0.0208	-4.603	0.750	0.210	0.0185	-4.538	0.667	13.99
	(0.162)	(4.211)	(0.719)	(9.637)	(0.606)	(4.239)	(1.259)	(6.937)	(0.298)	(8.128)	(1.517)	(15.89)
T. UNI Degree	-0.745	-6.238	-2.694	-20.91	-0.119	1.775	-0.431	0.796	0.628	11.38	2.273	19.88
	(0.874)	(8.260)	(2.891)	(29.42)	(0.689)	(5.041)	(2.457)	(17.45)	(1.125)	(7.837)	(3.603)	(22.13)
COMMU.>50000	0.314	-17.86*	2.226	-11.94	0.221	-0.577	1.569	-11.37	0.0647	12.16	0.458	12.88
	(1.077)	(10.45)	(4.720)	(15.63)	(0.728)	(9.314)	(3.534)	(25.00)	(0.400)	(10.08)	(2.423)	(26.23)
Pov 50% Disadv	-0.417	-5.420	0.192	-8.840	-0.891	-4.084	0.410	-13.71	0.712	-8.964	-0.328	-8.910
	(1.490)	(9.793)	(2.535)	(28.21)	(1.138)	(7.165)	(2.953)	(30.77)	(2.182)	(12.13)	(3.197)	(27.17)
Class size	0.439	272.3	1.379	180.8	-5.142	166.2	-16.14	-0.282	-16.75	229.7	-52.58	13.33
	(6.209)	(219.4)	(22.72)	(224.0)	(5.784)	(144.9)	(23.78)	(168.3)	(16.04)	(192.2)	(75.92)	(271.1)
Class size sq	-0.987	-115.0	-4.242	-88.02	4.147	-81.82	17.81	30.20	14.32	-146.5	61.52	-27.89
	(4.960)	(116.6)	(24.40)	(148.9)	(5.692)	(78.07)	(26.73)	(115.4)	(17.48)	(107.5)	(85.69)	(171.8)
Constant		-162.2		11.50		-120.2		-32.45		-65.76		-136.6
		(107.7)		(221.5)		(87.77)		(134.4)		(95.95)		(150.0)
Total (Expl/Unexpl)	**-27.38****	**11.14**	**-29.80****	**2.585**	**-27.04***	**20.35**	**-26.88**	**14.03**	**-15.17**	**17.65**	**-14.71**	**38.57***
	(11.43)	**(12.83)**	**(12.25)**	**(15.86)**	**(16.42)**	**(15.22)**	**(19.94)**	**(13.05)**	**(22.25)**	**(20.44)**	**(21.60)**	**(21.02)**
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap		Boys	Girls	Total Gap	
	287.5***	303.7***	-16.24*		397.8***	404.5***	-6.689		517.4***	514.9***	2.475	
	(7.344)	(5.504)	(9.314)		(6.456)	(5.387)	(8.398)		(9.796)	(10.17)	(14.02)	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.14: Jordan decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.162	1.118	0.972	-9.295	0.0400	-0.308	0.240	-3.552	0.155	1.549	0.930	-0.900
	(0.522)	(2.928)	(3.104)	(7.896)	(0.240)	(1.619)	(1.309)	(3.584)	(0.221)	(1.389)	(1.169)	(6.226)
Upper-sec	-1.008	3.122	-4.401	-19.72	-0.573	1.152	-2.502	-6.587	0.660	5.994	2.884	-14.53
	(1.390)	(6.268)	(5.679)	(27.14)	(0.811)	(4.546)	(3.483)	(14.35)	(0.884)	(4.085)	(3.403)	(20.75)
Post-sec not UNI	-1.114	1.660	-5.235	-28.35	-1.910*	-0.0138	-8.980***	-3.085	-0.424	5.292**	-1.991	2.409
	(1.130)	(4.778)	(4.246)	(19.79)	(1.026)	(4.355)	(2.911)	(9.707)	(0.507)	(2.653)	(2.404)	(17.74)
University degree	1.580	1.074	19.28	-65.32*	2.381*	-0.921	29.06***	-29.35	1.570*	5.428	19.16*	-12.83
	(1.636)	(7.689)	(15.11)	(37.86)	(1.280)	(6.730)	(9.834)	(23.06)	(0.943)	(5.289)	(10.35)	(35.00)
Native parents	-0.171	-10.01	-2.342	-9.257	-0.0685	-6.121	-0.935	-36.00	-0.0201	-15.46*	-0.274	-71.69
	(0.605)	(11.35)	(3.908)	(6.392)	(0.192)	(7.723)	(1.814)	(47.76)	(0.217)	(8.913)	(2.688)	(60.87)
One bookcases	-0.353	1.799	-2.205	10.92	-0.241	4.222	-1.506	-1.750	-0.392	1.356	-2.447	-12.54
	(0.407)	(3.999)	(2.313)	(22.00)	(0.273)	(3.276)	(1.521)	(20.24)	(0.347)	(3.081)	(1.756)	(18.11)
Two bookcases	0.0221	0.236	1.795	6.295	0.0610	2.349	4.961	10.49	0.0662	1.022	5.387	23.12
	(0.0737)	(2.904)	(3.316)	(14.73)	(0.328)	(3.240)	(5.020)	(15.48)	(0.291)	(3.818)	(4.606)	(16.49)
Home possess H	0.261	-3.541	42.05***	-49.34	0.217	-5.242	34.97***	6.720	0.0281	3.470	4.527	-32.18
	(2.984)	(17.91)	(14.08)	(52.77)	(2.498)	(8.678)	(7.026)	(22.47)	(0.296)	(7.476)	(4.753)	(66.28)
Home possess M	-3.499*	4.474	-28.40***	-32.33	-2.829**	-6.662	-22.96***	-13.51	-0.542	0.473	-4.398	-20.49
	(2.122)	(15.66)	(10.77)	(41.29)	(1.423)	(6.564)	(4.979)	(22.03)	(0.498)	(5.343)	(3.892)	(34.96)
TL spoken ALs	-0.223	-1.547	0.849	2.674	-0.403	-12.67	1.532	41.60	-0.423	-0.657	1.608	32.94
	(0.400)	(15.23)	(1.417)	(11.58)	(0.497)	(9.835)	(1.308)	(93.56)	(0.523)	(10.83)	(1.617)	(30.03)
PC at H&SCL	-0.0114	-6.436	0.0883	-2.492	-0.0345	3.206	0.266	17.17	-0.308	-0.620	2.378	27.60
	(0.526)	(11.87)	(4.153)	(83.18)	(0.423)	(9.877)	(2.852)	(69.37)	(0.633)	(8.588)	(2.172)	(23.39)
PC at H/SCL	-0.0811	-10.53	3.171	-18.38	-0.0490	-2.720	1.915	-13.84	-0.0166	1.877	0.647	-11.87
	(0.368)	(13.02)	(3.159)	(63.37)	(0.635)	(7.452)	(1.773)	(58.14)	(0.0738)	(7.651)	(1.708)	(31.78)
Male teacher	-50.07	74.83*	-54.90	49.51*	-14.27	29.75	-15.64	10.50	-34.90	49.06	-38.27	43.83
	(35.41)	(43.65)	(38.82)	(25.80)	(27.87)	(30.11)	(30.47)	(40.24)	(35.15)	(32.48)	(38.28)	(43.51)
T. Experience	0.135	-3.412	2.400	19.51	0.231	-13.61	4.098	3.114	0.320	-23.94**	5.680	13.03
	(0.615)	(15.02)	(4.274)	(38.83)	(1.811)	(12.22)	(5.040)	(57.62)	(2.286)	(9.465)	(5.013)	(41.44)
T. Certificate!	-0.181	9.104	-1.104	-2.069	0.0696	-0.587	0.424	14.82	0.100	-1.736	0.611	-43.34
	(0.540)	(17.48)	(2.728)	(49.35)	(0.518)	(18.69)	(2.988)	(40.12)	(0.538)	(16.24)	(2.137)	(69.88)
M SCL RCS	-0.0411	-22.08	-1.737	3.144	-0.0599	-20.99	-2.529	21.83	0.0376	-11.61	1.587	1.801
	(0.407)	(16.32)	(4.824)	(48.73)	(0.559)	(18.18)	(4.869)	(35.90)	(0.222)	(14.69)	(3.616)	(42.62)
L SCL RSC	0.0185	-6.546*	-2.697	-9.063	0.0312	-7.916**	-4.543**	-6.386	0.00779	-3.795	-1.136	-6.785
	(1.200)	(3.757)	(1.931)	(7.596)	(2.099)	(3.587)	(2.294)	(11.10)	(0.846)	(2.982)	(2.275)	(7.085)
T. UNI Degree	1.064	52.23	6.624	18.59	0.508	32.57	3.160	42.47	0.778	24.60	4.845	97.56
	(2.023)	(38.40)	(10.69)	(58.78)	(1.952)	(32.85)	(10.35)	(114.8)	(1.804)	(33.26)	(9.441)	(75.75)
COMMU.>50000	2.014	-9.803	4.179	-0.884	3.010	-4.358	6.247	6.531	2.114	-1.652	4.387	-21.91
	(2.217)	(11.36)	(6.835)	(31.34)	(2.730)	(9.583)	(8.500)	(23.38)	(2.016)	(7.955)	(6.015)	(40.36)
Pov 50% Disadv	1.769	-1.416	7.616	10.59	1.427	-1.573	6.145	-8.591	1.621	4.953	6.976	-14.82
	(1.577)	(7.718)	(5.339)	(21.12)	(2.037)	(8.159)	(6.059)	(17.34)	(1.856)	(6.008)	(4.362)	(21.26)
Class size	0.0527	-26.20	0.760	-454.8	1.073	-26.21	15.49	-294.3	5.667	166.5	81.78	52.33
	(3.445)	(201.0)	(59.05)	(382.9)	(4.810)	(175.2)	(55.23)	(503.7)	(7.911)	(166.9)	(55.36)	(346.1)
Class size sq	-0.0131	-10.24	-0.140	332.5	-0.124	-16.90	-1.321	101.4	-4.864	-89.51	-51.74	-80.69
	(3.780)	(104.1)	(51.05)	(295.2)	(4.111)	(85.05)	(44.13)	(344.8)	(6.016)	(80.53)	(42.45)	(213.6)
Constant		-19.02		266.3		56.07		124.6		-106.0		76.89
		(161.7)		(255.3)		(122.6)		(315.3)		(133.7)		(403.1)
Total (Expl/Unexpl)	**-56.70***	**18.84**	**-3.506**	**-2.114**	**-15.28**	**-3.103**	**45.35**	**-33.53**	**-28.36**	**20.18**	**42.03***	**-14.75**
	(34.29)	**(34.48)**	**(36.78)**	**(49.49)**	**(27.78)**	**(26.62)**	**(32.74)**	**(27.65)**	**(34.28)**	**(33.71)**	**(24.01)**	**(34.85)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	274.0	**311.9**	**-37.86*** **		**422.9**	**441.2**	**-18.38***		**551.7**	**559.9**	**-8.183**	
	(7.372)	**(8.635)**	**(10.99)**		**(6.733)**	**(7.779)**	**(10.53)**		**(4.355)**	**(5.762)**	**(7.273)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.15: Saudi Arabia decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.0700	-1.894	0.737	-2.876	-0.239	-3.624	-2.512	-1.659	-0.174	-3.134	-1.836	-1.782
	(0.194)	(2.947)	(1.943)	(2.885)	(0.286)	(2.253)	(1.574)	(2.233)	(0.215)	(2.685)	(1.467)	(2.445)
Upper-sec	-0.135	-1.754	4.950	-1.251	-0.200	-3.426	7.353	-2.376	-0.00259	-2.961	0.0950	-3.562
	(0.513)	(3.524)	(12.24)	(2.130)	(0.238)	(2.434)	(6.756)	(2.553)	(0.188)	(3.080)	(7.095)	(2.795)
Post-sec not UNI	-0.0664	-0.0164	-0.342	0.215	-0.205	0.285	-1.055	1.091	-0.109	-0.0299	-0.561	0.378
	(0.176)	(0.917)	(0.823)	(0.735)	(0.278)	(0.841)	(0.776)	(0.838)	(0.156)	(1.187)	(0.831)	(1.054)
University degree	-0.101	-1.587	-2.741	0.205	-0.331	-5.843	-8.946***	1.925	-0.402	-5.581	-10.86***	4.033
	(0.442)	(5.147)	(4.024)	(3.792)	(0.513)	(3.768)	(2.777)	(3.727)	(0.538)	(6.342)	(3.895)	(5.021)
Native parents	0.0405	-0.787	-0.154	-1.014	0.713	5.715	-2.715*	-4.130	0.940	-5.961	-3.578*	-19.05**
	(0.533)	(9.937)	(1.865)	(7.513)	(0.453)	(6.836)	(1.619)	(6.145)	(0.647)	(11.28)	(2.126)	(8.838)
One bookcases	-0.131	1.486	0.984	1.341	-1.317	0.680	9.921*	3.112	-0.941	3.786	7.092	5.402*
	(1.068)	(3.682)	(8.045)	(2.393)	(0.828)	(2.499)	(5.741)	(2.217)	(0.743)	(3.826)	(5.594)	(3.047)
Two bookcases	-0.0512	-0.482	-0.176	-0.424	-0.595	-0.549	-2.042	0.831	-1.228**	-0.0507	-4.216**	2.871
	(0.807)	(2.331)	(2.636)	(1.912)	(0.461)	(1.791)	(1.545)	(1.275)	(0.621)	(2.517)	(1.805)	(2.035)
Home possess H	-4.018*	13.61	-17.15*	25.98***	-3.902*	9.859	-16.66**	21.85***	-3.050**	7.149	-13.02**	16.36**
	(2.345)	(12.40)	(9.752)	(8.456)	(2.086)	(7.568)	(8.036)	(4.404)	(1.528)	(7.124)	(5.359)	(6.449)
Home possess M	0.177	16.31	7.629	21.76***	0.208	7.121	8.935	13.40**	0.0652	2.929	2.807	5.371
	(0.305)	(10.18)	(12.64)	(6.188)	(0.373)	(8.632)	(9.877)	(5.222)	(0.217)	(5.579)	(6.423)	(4.329)
TL spoken ALs	-0.990	3.815	-3.524	-2.197	-0.259	-2.285	-0.922	-4.402	-0.394	-5.663	-1.404	-8.502
	(0.806)	(7.065)	(2.852)	(6.084)	(0.686)	(6.991)	(2.409)	(5.749)	(1.043)	(9.247)	(3.639)	(5.552)
PC at H&SCL	-2.296	-3.835	-12.58	-8.212***	-1.713	-2.463	-9.386	-5.938**	-2.464	2.429	-13.51	-2.208
	(3.197)	(5.083)	(17.33)	(2.677)	(2.154)	(4.255)	(11.73)	(2.771)	(2.074)	(4.295)	(11.36)	(3.620)
PC at H/SCL	0.846	-8.604	3.976	-12.77***	1.803*	-2.154	8.475*	-9.868***	1.617	7.400	7.600	0.376
	(1.730)	(7.922)	(8.159)	(4.476)	(0.973)	(5.031)	(4.546)	(3.596)	(1.221)	(7.213)	(5.425)	(6.944)
Male teacher	-47.33	65.45	-50.26	17.59	-41.37	66.73	-43.93	24.85	-6.372	-12.65	-6.767	-19.47
	(102.8)	(103.7)	(109.2)	(35.64)	(41.41)	(49.93)	(43.88)	(20.45)	(10.30)	(35.18)	(10.90)	(37.52)
T. Experience	2.453	-13.28	6.102	-3.693	2.829	-11.89	7.038	-0.644	1.917	-5.753	4.770	1.474
	(3.106)	(13.00)	(6.039)	(7.262)	(2.868)	(10.38)	(5.094)	(5.848)	(2.850)	(10.48)	(5.016)	(6.245)
T. Certificate!												
M SCL RCS	0.649	16.04	-4.408	4.179	1.287	31.20**	-8.735***	6.375	1.353	18.69	-9.181**	-7.469
	(1.823)	(14.74)	(3.321)	(12.88)	(3.338)	(13.95)	(3.195)	(12.23)	(3.508)	(19.67)	(3.794)	(15.60)
L SCL RSC	1.411	1.031	3.699	-1.289	2.364	3.049	6.197**	-0.816	2.079	1.392	5.451	-2.011
	(1.807)	(3.343)	(2.784)	(2.878)	(1.985)	(3.049)	(2.686)	(2.430)	(2.466)	(3.370)	(3.332)	(2.773)
T. UNI Degree	-0.461	9.601	-1.687	-1.803	-0.565	17.85	-2.067	3.085	-0.844	11.90	-3.088	-11.88
	(1.167)	(28.32)	(2.138)	(25.03)	(0.772)	(28.34)	(2.606)	(18.74)	(1.625)	(49.33)	(2.907)	(46.11)
COMMU.>50000	-0.252	0.988	-4.435	6.467	-0.406	-0.793	-7.152	7.253*	-0.443	2.673	-7.798*	11.33**
	(0.492)	(7.151)	(4.415)	(5.536)	(1.419)	(5.948)	(4.654)	(4.409)	(0.746)	(6.875)	(4.435)	(4.585)
Pov 50% Disadv	0.104	0.180	-4.096	-0.476	-0.0118	-2.675	0.464	-2.500	0.0291	-0.611	-1.143	-0.729
	(0.613)	(2.754)	(10.45)	(1.686)	(0.120)	(2.444)	(8.614)	(2.361)	(0.332)	(2.459)	(8.319)	(2.031)
Class size	0.910	20.84	0.887	-18.35	1.140	49.82	1.111	5.693	0.911	36.28	0.887	-2.933
	(2.766)	(75.33)	(2.500)	(73.98)	(1.567)	(51.92)	(1.520)	(46.24)	(1.554)	(66.70)	(1.446)	(80.43)
Class size sq	-2.109	-8.914	-3.017	13.14	-2.715	-23.91	-3.883	-0.267	-1.566	-16.80	-2.240	3.836
	(3.857)	(29.58)	(5.379)	(38.99)	(3.501)	(20.19)	(5.026)	(27.67)	(2.648)	(30.28)	(3.774)	(42.89)
Constant		-98.18		-52.22		-121.9**		9.239		-41.07		188.8**
		(63.97)		(46.31)		(60.51)		(62.63)		(58.80)		(76.34)
Total (Expl/Unexpl)	**-53.08**	**19.20**	**-67.25**	**-16.15**	**-44.59**	**20.32**	**-54.64**	**69.21**	**-9.002**	**-1.552**	**-44.63****	**159.5*****
	(103.3)	**(100.2)**	**(109.0)**	**(44.13)**	**(40.77)**	**(43.67)**	**(45.79)**	**(42.24)**	**(11.92)**	**(13.29)**	**(17.36)**	**(44.19)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	216.9	**250.8**	**-33.88*****		**317.7**	**342.0**	**-24.27*****		**423.5**	**434.1**	**-10.55***	
	(5.569)	**(5.555)**	**(7.671)**		**(5.359)**	**(4.030)**	**(7.012)**		**(4.361)**	**(3.902)**	**(5.760)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.16: Egypt decomposition of maths test scores by gender (girls as reference)

VARIABLES	Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys		Without reweighting Girls are reference group		F(x) for girls Reweighted to Boys	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	-0.336	-1.671	-0.352	-2.040	-0.143	3.543	-0.149	4.305	-0.0193	1.057	-0.0202	2.270
	(0.728)	(6.772)	(0.757)	(9.188)	(0.366)	(4.638)	(0.391)	(5.719)	(0.353)	(3.401)	(0.370)	(4.143)
Upper-sec	-0.250	0.631	-0.235	1.582	-0.331	3.262	-0.311	4.311*	-0.0952	4.404*	-0.0892	6.339**
	(0.512)	(3.574)	(0.455)	(4.455)	(0.306)	(2.081)	(0.287)	(2.223)	(0.287)	(2.382)	(0.264)	(2.873)
Post-sec not UNI	0.00825	-0.674	0.0332	-1.114	0.0150	1.167	0.0601	1.363	0.0187	2.335	0.0751	3.508
	(0.110)	(4.762)	(0.0592)	(6.490)	(0.502)	(2.800)	(0.199)	(2.613)	(0.871)	(4.706)	(0.340)	(5.436)
University degree	0.0665	-0.401	0.0639	-0.833	-0.202	2.066	-0.194	1.431	-0.00568	3.007	-0.00546	3.385
	(0.910)	(5.319)	(0.881)	(6.586)	(0.422)	(2.592)	(0.391)	(2.960)	(0.446)	(3.102)	(0.425)	(3.684)
Native parents	-1.144	6.279	-0.904	1.275	-1.409	21.89***	-1.114**	17.15*	-0.730	14.74*	-0.577*	9.051
	(1.132)	(15.42)	(0.627)	(17.86)	(1.277)	(8.296)	(0.540)	(9.067)	(0.850)	(7.521)	(0.333)	(7.079)
One bookcases	-0.00158	2.466	-0.00175	3.230	-0.242	0.957	-0.267	1.552	-0.121	2.381	-0.134	2.394
	(0.202)	(2.722)	(0.231)	(3.245)	(0.293)	(3.014)	(0.222)	(3.205)	(0.169)	(3.058)	(0.186)	(3.287)
Two bookcases	-0.0515	0.471	-0.0522	0.660	0.00598	-0.407	0.00606	-0.289	0.0197	1.455	0.0199	0.0949
	(0.108)	(2.182)	(0.107)	(2.056)	(0.0745)	(1.749)	(0.0689)	(1.710)	(0.0975)	(1.682)	(0.0761)	(1.822)
Home possess H	0.899	-8.049	0.331	-5.063	0.892	-2.025	0.328	-3.245	0.594	0.317	0.219	2.736
	(2.353)	(5.861)	(0.782)	(6.349)	(2.114)	(4.285)	(0.715)	(4.996)	(1.288)	(4.707)	(0.431)	(5.444)
Home possess M	-1.879	-12.65	-1.683**	-7.535	-1.784	-6.414	-1.598***	-7.757	-0.931	-2.059	-0.834**	-0.378
	(1.324)	(11.98)	(0.694)	(12.85)	(1.212)	(6.732)	(0.590)	(8.326)	(0.610)	(6.136)	(0.349)	(6.583)
TL spoken ALs	-0.620	12.87	-0.509	13.42	-1.147	12.05*	-0.943**	12.57*	-1.275	8.981	-1.048**	8.065
	(0.627)	(8.501)	(0.361)	(10.21)	(0.854)	(7.066)	(0.422)	(7.489)	(0.901)	(7.640)	(0.497)	(8.898)
PC at H&SCL	-1.983	1.706	-2.040**	3.132	-1.510*	-1.262	-1.554*	-2.236	-0.864	4.435	-0.889	6.300
	(1.218)	(5.375)	(0.887)	(6.774)	(0.846)	(4.242)	(0.809)	(4.351)	(0.809)	(4.110)	(0.819)	(4.583)
PC at H/SCL	3.044**	1.839	3.181**	2.562	2.884**	2.824	3.015**	1.846	2.796*	6.902	2.923*	10.21
	(1.418)	(10.05)	(1.428)	(11.07)	(1.244)	(7.530)	(1.267)	(8.624)	(1.608)	(7.891)	(1.654)	(8.718)
Male teacher	-1.781	9.223	-1.756	8.693	0.151	7.224	0.149	6.290	1.322	-2.861	1.303	-3.554
	(2.588)	(11.58)	(2.437)	(14.83)	(1.458)	(11.85)	(1.428)	(11.86)	(1.581)	(11.68)	(1.409)	(11.03)
T. Experience	-0.748	4.872	-1.388	9.843	-0.814	-0.108	-1.511	1.723	-0.108	-2.616	-0.200	-4.403
	(1.927)	(16.40)	(1.674)	(20.82)	(1.567)	(12.23)	(1.161)	(13.68)	(0.252)	(11.53)	(0.463)	(12.92)
T. Certificate!	0.0298	16.85	0.0456	7.090	0.0269	6.037	0.0412	-3.644	0.0418	-13.26	0.0641	-18.87*
	(0.189)	(14.05)	(0.191)	(14.45)	(0.171)	(8.665)	(0.124)	(8.784)	(0.335)	(10.40)	(0.152)	(11.24)
M SCL RCS	-0.230	-3.913	-0.303	1.162	-0.325	-18.59*	-0.429	-19.03**	-0.306	-18.89**	-0.403	-19.30**
	(0.608)	(14.07)	(0.790)	(14.52)	(0.559)	(9.791)	(0.518)	(9.285)	(1.128)	(9.593)	(0.594)	(8.624)
L SCL RSC	-0.135	2.107	-0.0919	2.474	-0.148	0.687	-0.101	0.544	-0.139	0.598	-0.0948	0.867
	(0.563)	(3.028)	(0.179)	(3.609)	(1.324)	(1.762)	(0.466)	(1.726)	(0.786)	(1.355)	(0.274)	(1.473)
T. UNI Degree	-1.292	60.28	-1.209	62.74	0.511	51.32	0.478	58.90	2.819*	-46.61	2.637**	-37.09
	(2.265)	(320.3)	(2.174)	(322.9)	(2.223)	(311.4)	(2.075)	(311.6)	(1.596)	(80.93)	(1.262)	(80.96)
COMMU.>50000	1.199	-1.759	1.163	-3.885	0.813	-0.185	0.789	-3.402	-0.340	9.040	-0.330	6.405
	(1.141)	(8.154)	(1.008)	(8.891)	(1.106)	(6.154)	(0.716)	(5.892)	(0.702)	(6.457)	(0.607)	(6.462)
Pov 50% Disadv	0.642	8.343	0.773	5.160	0.852	10.61	1.025	8.492	0.500	13.70*	0.602	9.904
	(2.047)	(7.529)	(1.034)	(10.10)	(1.999)	(8.000)	(0.871)	(8.105)	(1.037)	(7.758)	(0.563)	(7.279)
Class size	3.034	101.5	2.770	122.2	3.696	129.6	3.373	166.9	-2.986	-132.1	-2.725	-132.7
	(9.537)	(164.3)	(5.901)	(156.6)	(7.564)	(220.4)	(6.032)	(283.0)	(4.069)	(144.8)	(3.386)	(158.1)
Class size sq	-2.562	-66.02	-2.517	-77.36	-2.976	-78.57	-2.924	-92.21	3.032	57.96	2.978	64.69
	(8.866)	(89.17)	(5.821)	(91.38)	(6.493)	(119.2)	(5.663)	(152.1)	(3.661)	(79.45)	(3.205)	(85.75)
Constant		-158.0		-172.9		-172.5		-181.1		83.50		76.37
		(356.5)		(350.8)		(343.2)		(349.6)		(129.9)		(137.7)
Total (Expl/Unexpl)	**-4.731**	**-12.65**	**-4.590**	**-13.82**	**-1.849**	**-12.52***	**-2.852**	**-12.39**	**0.316**	**-7.480**	**0.770**	**8.078**
	(5.777)	**(9.289)**	**(3.395)**	**(8.840)**	**(4.895)**	**(7.077)**	**(3.106)**	**(7.622)**	**(4.273)**	**(6.595)**	**(3.083)**	**(6.851)**
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	248.7	**266.1**	**-17.38***		**384.8**	**399.2**	**-14.37***		**517.0**	**524.1**	**-7.164**	
	(7.345)	**(7.242)**	**(9.133)**		**(5.288)**	**(6.077)**	**(7.599)**		**(5.725)**	**(4.614)**	**(7.788)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included.

Table B-5.17: Iran detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.103	-5.986	0.173	-4.498	-0.0150	-3.118	-0.0251	-3.319	0.0322	-1.780	0.0539	-1.961
	(0.309)	(5.655)	(0.218)	(5.119)	(0.0716)	(3.164)	(0.106)	(3.333)	(0.185)	(3.434)	(0.123)	(3.560)
Upper-sec	-0.0944	-1.265	-0.0866	-2.302	-0.792*	-0.314	-0.727**	-0.701	-1.178*	5.211	-1.081**	4.144
	(0.600)	(4.183)	(0.555)	(4.590)	(0.479)	(2.422)	(0.354)	(2.663)	(0.633)	(3.516)	(0.526)	(3.701)
Post-sec not UNI	0.0867	-0.672	0.0962	-1.195	0.253	-1.177	0.280	-1.642	0.585	3.465	0.649*	3.154
	(0.258)	(1.713)	(0.291)	(2.397)	(0.300)	(1.718)	(0.273)	(2.011)	(0.822)	(2.365)	(0.354)	(2.452)
University degree	0.0303	-0.966	-0.00127	-1.129	-0.124	-2.119	0.00520	-2.372	-0.533	2.151	0.0224	2.167
	(0.348)	(2.701)	(0.0676)	(2.982)	(0.334)	(1.901)	(0.0714)	(1.938)	(1.601)	(3.317)	(0.336)	(3.384)
Native parents	-0.592	37.94	-0.635*	40.78	-0.454	47.16**	-0.487**	49.15**	-0.357	4.069	-0.383***	4.496
	(0.584)	(32.16)	(0.362)	(30.96)	(0.282)	(22.25)	(0.196)	(22.31)	(0.220)	(19.07)	(0.118)	(19.43)
One bookcases	0.00859	-1.917	0.0176	-1.807	0.0931	0.458	0.191*	0.098	0.168	3.141	0.344*	3.609
	(0.0564)	(1.721)	(0.0816)	(1.684)	(0.476)	(1.965)	(0.106)	(2.100)	(1.010)	(3.086)	(0.179)	(3.409)
Two bookcases	0.259	-2.636	0.265	-2.832	-0.0652	-2.068	-0.0667	-1.491	-0.226	-3.189	-0.231	-2.371
	(0.483)	(1.945)	(0.414)	(1.947)	(0.293)	(2.029)	(0.281)	(2.141)	(0.437)	(3.299)	(0.443)	(3.347)
Home possess H	0.0315	1.754	0.0374	4.327	0.0859	2.265	0.102	3.285	0.165	6.945	0.196	5.35
	(0.231)	(5.245)	(0.112)	(4.948)	(1.110)	(6.136)	(0.248)	(6.201)	(1.592)	(7.033)	(0.342)	(7.386)
Home possess M	-0.504	3.877	-0.532	4.64	-0.432	5.145	-0.455**	5.949	-0.362	6.252	-0.382	5.945
	(0.666)	(5.950)	(0.420)	(6.615)	(0.432)	(4.116)	(0.204)	(4.300)	(0.450)	(4.739)	(0.289)	(4.678)
TL spoken ALs	-1.924	3.953	-2.130***	6.66	-1.685	0.900	-1.866*	0.922	-0.270	-6.408	-0.299	-6.324
	(1.352)	(7.766)	(0.823)	(7.761)	(1.510)	(7.220)	(1.027)	(6.699)	(1.152)	(8.495)	(1.241)	(7.919)
PC at H&SCL	-0.226	-0.164	-0.320	-0.0633	-0.440	0.661	-0.622*	0.567	-1.299	-3.243	-1.838**	-4.302
	(0.739)	(0.983)	(0.230)	(0.986)	(0.847)	(1.671)	(0.338)	(1.684)	(2.881)	(5.222)	(0.740)	(5.676)
PC at H/SCL	0.213	-1.595	0.254	-2.398	0.255	1.265	0.305	0.696	0.0554	-6.866	0.0662	-7.533
	(0.773)	(4.719)	(0.338)	(4.274)	(0.510)	(5.406)	(0.321)	(5.612)	(0.229)	(5.877)	(0.281)	(6.532)
Male teacher												
T. Experience												
T. Certificate!												
M SCL RCS	-0.282	-8.125	0.104	-7.024	-0.366	-7.731	0.135	-10.98	-0.728	-28.24	0.268	-14.06
	(1.555)	(11.15)	(0.334)	(10.32)	(1.527)	(12.18)	(0.305)	(12.55)	(3.868)	(30.53)	(0.825)	(27.98)
L SCL RSC	0.0805	-8.302*	-0.382	-9.283**	0.0640	-4.688	-0.304	-5.736	0.0641	-5.899	-0.304	-3.598
	(2.783)	(4.567)	(0.627)	(4.308)	(2.104)	(4.396)	(0.433)	(4.329)	(2.989)	(7.901)	(0.687)	(7.636)
T. UNI Degree												
COMMU.>50000	-0.0921	-20.40**	-0.0910	-22.18**	0.216	-3.876	0.214	-3.753	0.346	3.776	0.342	1.868
	(0.475)	(9.927)	(0.215)	(9.487)	(1.420)	(8.360)	(0.363)	(9.155)	(2.290)	(8.998)	(0.622)	(8.290)
Pov 50% Disadv	-1.909	-3.017	-1.456	-2.409	-2.026	-2.018	-1.545*	-0.883	-1.485	-5.816	-1.132	-3.788
	(1.694)	(7.423)	(1.216)	(7.612)	(1.664)	(5.740)	(0.933)	(5.819)	(2.004)	(8.959)	(1.279)	(7.777)
Class size	12.22	223.8	9.868	156	2.997	144.7	2.419	66.39	-1.984	246.1	-1.601	243.4
	(11.23)	(209.4)	(7.417)	(195.4)	(5.691)	(142.9)	(4.744)	(131.1)	(7.115)	(181.7)	(6.159)	(154.4)
Class size sq	-8.207	-92.26	-7.207	-51.7	-1.922	-72.25	-1.688	-29.85	0.692	-154.2	0.607	-147.2*
	(8.729)	(109.6)	(6.101)	(102.0)	(4.578)	(74.49)	(4.183)	(68.51)	(5.413)	(99.48)	(5.176)	(89.06)
Constant		-138.9		-118.9		-105.5		-68.87		-57.32		-75.88
		(90.76)		(84.82)		(75.59)		(70.55)		(96.59)		(79.53)
Total (Expl/Unexpl)	-0.301	-15.94**	-2.966	-15.33**	-6.837	0.148	-4.477**	1.336	-10.42	12.89	-4.741	11.92
	(6.168)	(7.344)	(2.661)	(7.668)	(7.109)	(6.991)	(2.049)	(6.818)	(11.65)	(10.54)	(3.156)	(9.614)
Raw Gap	**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**		**Boys**	**Girls**	**Total Gap**	
	287.5* **	**303.7*** **	**-16.24***		**397.8*** **	**404.5*** **	**-6.689**		**517.4*** **	**514.9*** **	**2.475**	
	(7.344)	**(5.504)**	**(9.314)**		**(6.456)**	**(5.387)**	**(8.398)**		**(9.796)**	**(10.17)**	**(14.02)**	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Table B-5.18: Saudi Arabia detailed decomposition of maths test scores by gender (boys as reference)

VARIABLES	Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls		Without reweighting Boys are reference group		F(x) for Boys Reweighted to Girls	
	10th quantile				50th quantile				90th quantile			
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Lower-sec EDC	0.265	-2.158	0.223	0.406	0.140	-4.171*	0.118	-3.506	0.161	-3.654	0.135	-3.75
	(0.328)	(3.229)	(0.277)	(2.772)	(0.278)	(2.409)	(0.217)	(2.602)	(0.361)	(3.003)	(0.244)	(3.886)
Upper-sec	0.0755	-2.121	0.0808	-1.166	0.211	-4.055	0.226	-3.477	0.353	-3.611	0.378	-4.927
	(0.254)	(4.059)	(0.233)	(5.522)	(0.268)	(2.654)	(0.301)	(3.186)	(0.439)	(3.426)	(0.409)	(3.906)
Post-sec not UNI	-0.0647	-0.0184	-0.0214	0.873	-0.275	0.345	-0.0911	0.286	-0.0972	-0.0917	-0.0322	0.0501
	(0.232)	(1.127)	(0.0987)	(1.220)	(0.299)	(1.036)	(0.140)	(1.195)	(0.270)	(1.453)	(0.109)	(1.665)
University degree	-0.0384	-2.147	-0.0517	2.059	-0.114	-6.393	-0.153	-5.107	-0.198	-6.024	-0.266	-8.36
	(0.148)	(5.461)	(0.184)	(8.656)	(0.173)	(3.941)	(0.178)	(4.103)	(0.501)	(6.516)	(0.367)	(7.411)
Native parents	0.114	-0.595	0.0963	-2.848	0.322	6.632	0.271	3.681	1.319	-5.324	1.110*	-10.61
	(0.549)	(10.69)	(0.444)	(12.53)	(0.433)	(7.391)	(0.361)	(8.664)	(1.007)	(12.50)	(0.572)	(14.45)
One bookcases	-0.805	1.956	-0.704	-2.141	-1.635	0.701	-1.431*	-0.151	-2.691	5.451	-2.355*	4.748
	(1.097)	(5.315)	(0.944)	(5.095)	(1.014)	(3.619)	(0.806)	(3.913)	(1.683)	(5.522)	(1.405)	(5.125)
Two bookcases	0.175	-0.724	0.153	-2.526	-0.365	-0.693	-0.319	-1.099	-1.247	0.127	-1.091	-0.764
	(0.811)	(3.411)	(0.667)	(3.345)	(0.527)	(2.528)	(0.448)	(2.889)	(0.978)	(3.604)	(0.750)	(3.779)
Home possess H	-8.230***	17.32	-8.311***	14.71	-6.902***	11.98	-6.969***	8.774	-5.157**	8.488	-5.207***	3.638
	(3.098)	(16.04)	(2.349)	(18.94)	(1.709)	(9.616)	(1.249)	(11.01)	(2.119)	(9.249)	(1.664)	(7.531)
Home possess M	0.783	15.57	0.934	12.61	0.464	6.334	0.554*	3.265	0.166	2.606	0.198	1.246
	(1.111)	(9.543)	(0.618)	(12.95)	(0.546)	(8.193)	(0.288)	(9.838)	(0.301)	(5.350)	(0.199)	(4.974)
TL spoken ALs	-0.316	2.948	-0.279	9.945	-0.662	-1.692	-0.585	-1.229	-1.396	-4.268	-1.233	-2.661
	(1.088)	(5.715)	(0.968)	(7.252)	(1.096)	(5.798)	(0.973)	(7.094)	(1.141)	(7.341)	(0.929)	(6.949)
PC at H&SCL	-4.877***	-1.403	-4.498***	-0.47	-3.174*	-0.748	-2.927**	-0.587	-0.747	0.894	-0.689	1.286
	(1.650)	(1.814)	(1.482)	(2.153)	(1.663)	(1.473)	(1.468)	(1.451)	(2.122)	(1.564)	(1.939)	(1.884)
PC at H/SCL	3.230***	-10.95	2.603***	-9.574	2.369**	-2.216	1.909**	-0.673	-0.492	10.01	-0.397	15.15
	(1.181)	(10.05)	(0.846)	(13.82)	(1.051)	(6.393)	(0.835)	(6.714)	(1.650)	(9.239)	(1.333)	(9.898)
Male teacher												
T. Experience												
T. Certificate!												
M SCL RCS	-0.147	17.58	-0.244	15.22	-0.219	33.97**	-0.364	30.43**	0.429	21.05	0.710	8.545
	(0.515)	(15.40)	(0.944)	(16.52)	(0.537)	(13.62)	(0.882)	(14.15)	(0.704)	(21.20)	(1.232)	(26.38)
L SCL RSC	0.768	2.029	0.266	1.842	0.702	4.766	0.243	2.958	1.449	2.197	0.501	-1.053
	(1.972)	(5.542)	(0.598)	(6.175)	(1.688)	(4.762)	(0.509)	(4.272)	(2.135)	(5.710)	(0.631)	(6.870)
T. UNI Degree												
COMMU.>50000	-0.327	0.0542	-0.382	2.4	-0.365	-1.515	-0.426	-3.688	-0.640	2.262	-0.747	-2.874
	(1.440)	(6.940)	(0.703)	(9.577)	(1.445)	(5.527)	(0.675)	(5.949)	(2.047)	(6.933)	(0.845)	(8.264)
Pov 50% Disadv	0.0629	-0.230	0.0510	-0.0192	0.279	-2.665	0.226	-3.155	0.0919	-1.209	0.0745	-2.089
	(0.276)	(2.924)	(0.210)	(2.887)	(0.868)	(2.763)	(0.306)	(2.665)	(0.238)	(2.486)	(0.194)	(2.138)
Class size	-0.195	26.77	-0.0318	49.75	-0.995	48.91	-0.162	56.89	0.288	19.10	0.0470	54.06
	(2.926)	(77.35)	(0.530)	(95.21)	(2.794)	(54.48)	(0.738)	(51.64)	(2.458)	(48.16)	(0.543)	(71.06)
Class size sq	1.706	-15.49	0.408	-32.16	5.580	-31.47	1.334	-36.48	0.378	-10.24	0.0904	-26.63
	(10.49)	(40.75)	(2.322)	(47.43)	(6.816)	(27.06)	(1.423)	(27.87)	(7.285)	(25.80)	(1.727)	(38.78)
Constant		-80.53		-99.63*		-82.39**		-74.18*		-42.53		-35.42
		(53.53)		(53.75)		(42.00)		(40.10)		(45.73)		(59.43)
Total (Expl/Unexpl)	-6.703	-27.18***	-8.711**	-33.70***	-3.853	-20.42***	-7.853***	-22.78***	-5.601	-5.601	-7.890***	-7.794
	(9.462)	(9.810)	(4.187)	(11.25)	(6.248)	(6.960)	(2.676)	(7.109)	(7.068)	(7.068)	(3.023)	(8.031)
Raw Gap	Boys	Girls	Total Gap		Boys	Girls	Total Gap		Boys	Girls	Total Gap	
	216.9***	250.8***	-33.88***		317.7***	342.0***	-24.27***		423.5***	434.1***	-10.55*	
	(5.569)	(5.555)	(7.671)		(5.359)	(4.030)	(7.012)		(4.361)	(3.902)	(5.760)	

Jackknife Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Dummy controls for missing observations included

Appendix C-4:Quantile Decomposition Do-file

```
*    Quantile decomposition on Turkey  *
*Inequality analysis using reweight hybrid with Recentered Influence Function (RIF) for quantiles *
**ALL PLAUSIBLE VALUES**
#delimit ;
clear all;
capture log close;
set more off;
set mem 500m;
local date: di %d date(c(current_date),"DMY");
cd "E:\Fourth chapter\Data and Do\Turkey";
log using AN_RIF_TURF`date'.log, replace;
*generating the counterfactual sample group*;
use mergedturM ; tab itsex, gen(itsex); gen male = itsex2; gen female = itsex1;
save temp01,replace; keep if male==0; replace male=2; save temp2, replace;
use temp01, clear; append using temp2;
*Defining variables*;
do var_define;
* Interactions;
*"These interactions are necessary for producing proper weights, revise demographic changes and employ (Balck et al 2009)";*
*we do not need interactions here we have run the "hotelling" test for mean equality and it proves equality*
*Testing of mean equality-RE-Weight.do*
**********************************************************************************************;
*keep the used variables only to fasten the jackknife calculations'
# delimit;
*generate local for covariates to save space and time it is repeatedly generated and used;
Local controls bsdgedup2 bsdgedup3 bsdgedup4 bsdgedup5 TURparents
onebookcases twobookcases homepossessH homepossessM bs4golanALWS
PChomeandSCL PChomeorSCL  bt4gsexM bt4gtaut1 bt4gtlceyes bcdsrmiM bcdsrmiL bt4gfedcuni bc4gcomuG50  bc4gsbedG50P  bt4mstud1 bt4mstud2;
```

```
*generate local for missing observations controls;

Local control_missing DMbsdgedup DMbsdgborn DMbs4gbook DMhomepossessinx DMbs4golan DMbsdgcavl DMbt4gsex DMbt4gtaut DMbt4gtlce DMbcdsrmi DMbt4gfedc DMbc4gcomu DMbc4gsbed DMbt4mstud;

Keep `controls' `contol_missing' totwgt female male bsmmat*  jkzone jkrep;

**********************************************************************;

********** compute weights; ********** Probit for male effect;

probit male `controls' `control_missing' [iweight= totwgt] if male==0 | male==1 ;

predict malew, p;

summ malew , detail;

summ male [aweight=totwgt] if male==0 | male==1 ;

gen pbar=r(mean);

replace  totwgt= totwgt*(malew/(1-malew))*((1-pbar)/pbar)  if male==2;


*investigate bandwidth as double the normal weight or use the exact the graph will compare them;

twoway (kdensity bsmmat01 [aw=totwgt] if male==0 | male==1, lcolor(black) )(kdensity bsmmat01[aw=totwgt] if male==0 | male==1, width(38) ///

 lcolor(red) )(kdensity bsmmat01[aw=totwgt] if male==0 | male==1, width(9) lcolor(green) );

**************************************************************************************;

** get recentered influence functions for 10, 50 and 90 centiles;

****defining the program to do the work;

program define rifgen;

foreach var of local 0{;

forvalues it = 0(1)2 {    ;

pctile valx=`var' if male==`it' [aweight=totwgt], nq(100) ;

kdensity `var' [aweight= totwgt] if male==`it', at(valx) gen(evalt`it' denst`it') width(19) nograph ;

 forvalues qt = 10(40)90 {        ;

 local qc = `qt'/100.0;

 gen rif_`var'`it'_`qt'=evalt`it'[`qt']+`qc'/denst`it'[`qt'] if `var'>=evalt`it'[`qt'] & male==`it';

 replace rif_`var'`it'_`qt'=evalt`it'[`qt']-(1-`qc')/denst`it'[`qt'] if `var'<evalt`it'[`qt']& male==`it';

  };
```

```
 drop valx;
};
drop eval* denst*;
};
end;
```

*Running the program for the five plausible values, this will generate the RIF for them at all the required quantiles;

```
rifgen bsmmat01 bsmmat02 bsmmat03 bsmmat04 bsmmat05;
program drop rifgen;
*******************************************************************************;
# delimit;
foreach var of varlist bsmmat01 bsmmat02 bsmmat03 bsmmat04 bsmmat05{;
gen rifat`var'=.;
};
forvalues qt = 10(40)90 {        ;
di "evaluating quantile= " `qt';
** get decomposition without reweighing [E(X_1|t=1)- E(X_0|t=0)]B_0   ;
foreach var of varlist bsmmat01 bsmmat02 bsmmat03 bsmmat04 bsmmat05{;
 replace rifat`var'=rif_`var'0_`qt' if male==0;
 replace rifat`var'=rif_`var'1_`qt' if male==1;
 };
*running estimates for the quantile decomposition without reweighting*;
pv `controls' `control_missing' [aweight= totwgt] if male==0 | male==1, cmd(oaxaca) pv(rifat*)cmdops(by(male) weight(0) swap detail (groupDM:`control_missing') relax) jkzone(jkzone) jkrep(jkrep) jrr timss;
*save estimates*;
est sto WRa`var'_`qt';
matrix Ra`qt'=e(b);
*******************************************************************************;
foreach var of varlist bsmmat01 bsmmat02 bsmmat03 bsmmat04 bsmmat05{;
replace rifat`var'=.;
*** get characteristics effects with reweighing [E(X_0|t=1)- E(X_0|t=0)]B_c  as explained in chapter 4 ;
 replace rifat`var'=rif_`var'2_`qt' if male==2;
 replace rifat`var'=rif_`var'0_`qt' if male==0;
```

```
 };
pv `controls' `control_missing'[aweight= totwgt] if male==0 | male==2, cmd(oaxaca) pv(rifat*) cmdops(by(male) weight(0) swap detail(groupDM:`control_missing') relax) jkzone(jkzone) jkrep(jkrep) jrr timss ;
*save estimates;
est store CRc`var'_`qt';
matrix Rc=e(b);
*********************************************************************************************;
 foreach var of varlist bsmmat01 bsmmat02 bsmmat03 bsmmat04 bsmmat05{;
replace rifat`var'=.;
*** get coefficients effects E(X_1|t=1)*[B_1-B_c]  as unexplained in chapter 4 ;
 replace rifat`var'=rif_`var'1_`qt' if male==1;
 replace rifat`var'=rif_`var'2_`qt' if male==2;
 };
pv `controls' `control_missing' [aweight=totwgt] if male==1 | male==2, cmd(oaxaca) pv(rifat*) cmdops(by(male) weight(0) detail (groupDM:`control_missing') relax) jkzone(jkzone) jkrep(jkrep) jrr timss;
*save estimates;
 est store SRw`var'_`qt';
*********************************************************************************************;
outreg2 [WRa_10 CRc_10 SRw_10] using TURF10Q, replace excel;
outreg2 [WRa_50 CRc_50 SRw_50] using TURF50Q, replace excel;
outreg2 [WRa_90 CRc_90 SRw_90] using TURF90Q, replace excel;
Log close;
```

Chapter 6

CONCLUSIONS

6.1 Introduction

The aims of this study were to examine the determinants of educational learning outcomes and gender inequality of educational outcomes in MENA countries. The literature indicates quite important links between education, human capital and economic growth. There has been substantial attention to the education process in developed countries. Reviews of education production functions and comparative studies have been employed to gain better understanding of school effectiveness to enhance educational quality and help building up human capital (Hanushek, 1995, Behrman, 2010, Glewwe et.al, 2011). High quality empirical studies are available to guide policy makers to the most effective ways to enhance the learning outcomes.

The education production function framework considers schools as production units that produce learning depending on inputs from school resources and teacher characteristics given student characteristics. To increase the performance of students, a relevant mix of these factors should be identified and employed under the predefined constraints such as budget limit of schools.

The education component in human capital has been considered a vital player in economic growth in developed countries. Countries in transition like MENA countries after the so called Arab-Spring should invest in human capital building and increase understanding of the driving forces of better outcomes of education. The inequality is a major challenge in such a region where income distribution is biased in favour of small minorities.

Given the central role of students' educational performance for the future economic prospects of societies, the empirical results of education production functions estimated for the eight MENA countries in this study could have substantial implications for educational and social policies in the region. For the MENA countries, the evidence for the first time reveals the impact of family background

and schooling policies in the different school systems. By examining the determinants of educational performance in the best performing MENA countries, other countries can derive lessons for education policy.

The distortions of education distributions among groups were argued to have a substantial influence on the social and economic outcomes in part of the developing countries. The thesis adds to the literature by addressing the gender inequality of educational outcomes (achievement) in MENA region and so examines inequality in outcomes rather than enrolment (inputs). The comparative and uniform country analysis of MENA countries using appropriate techniques allow us to draw many conclusions and contributions, while still leaving open several future possible research questions.

6.2 Summary of findings

MENA countries share many characteristics although they also differ in many aspects. They have common characteristics such as religion, culture, geographical place, desert climate in most areas, language (with exceptions) and history; they share a relatively low performance of educational outcomes compared to other countries of similar income for which TIMSS data are available. The poor performance of MENA countries is the first conclusion to be drawn from this study.

This study provides, for the first time, concrete evidence on educational production functions in MENA. The literature indicates a debate over the effectiveness of school factors on the quality of the outcomes (Hanushek, 1995, Glewwe et.al, 2011). We find here the overall impact of school level variables on performance across the whole range of countries is very weak except for Turkey. This suggests a special difference in the Turkish education system production process to the other countries. The dominance of home background and student characteristics effects on the learning outcomes in MENA paradoxically implies more attention needs to be given to the school factors. The insignificant impacts of observed school characteristics and teachers' qualifications do not mean that schools are not important, but they are not effective and the mechanisms through which they work need more investigation. The school factors include a lot of endogenous variables

which affect the learning outputs which show more variations come from the school side when the school fixed effects technique has been employed. The significant effect of school resources in Turkey and Iran explain more differences across the education systems. Although, it seems that school level variables play little role in general, the detailed investigation in Egypt shows major differences come from school type reflecting differences in resources and practices in those schools.

The meta-regression analysis identifies some common patterns for home background side, though the striking finding is the negative effect of computer usage across countries. Except for Iran and Turkey, computer usage has a negative impact on the learning outcomes of students in MENA. Policy should focus on the issue of ICT in the learning process as providing ICT facilities does not appear to effective. The success story of Turkey might be of interest to get more insight of how a more effective ICT policy could enhance the quality of learning. Family background proxies, parental education and number of books at home seem to have the largest effects on student's performance in maths in the three top performing countries (Tunisia, Jordan and Turkey). The number of books effect was the lowest in Egypt and Syria. Home possessions are the variables with the most consistent effect across MENA countries. Those findings go in line with literature findings in most regions of the world (Hanushek, 1995, Woessmann, 2002, and Glewwe e.al, 2011).

Grant and Behrman (2010) argue that female students progress through school at the same pace as or faster than their male peers. Schooling attainment, as measured by grades of school completed, does not necessarily accurately reflect the learning outcomes of children. There might be large variations in school quality and home background which may have implications for gender differences in learning despite the same level of schooling attainment. If girls are likely to attend different types of schools than boys, tend to take different classes than boys, are treated differently than boys in the same classes, or are treated differently outside of school than boys are, this might have an effect on the equality of learning quality between boys and girls.

Investigating the gender gap in learning outcomes in MENA is another contribution of this study. The gender differences in maths performance are significant, though mixed results were found across countries. The gap is pro-boys in Algeria, Syria and Tunisia and pro-girls in Jordan, Egypt, and Saudi Arabia. The role of gender in the education production function is different across the countries. The decomposition analysis on the mean and along the distribution provides a major contribution to the investigation of gender inequality in outcomes. MENA countries do not exhibit a common pattern across quantiles with respect to gender effects; in pro-boys countries the gap is larger at the bottom of the distributions and tends to decrease. This may explain the insignificant estimates from the OLS average estimates in some countries. The pro-girls countries show more of a gap in maths across all quantiles. In the gender-neutral country, Turkey, although there is no gender difference overall, this reflects the countervailing balance of two effects: the characteristics effect which favours girls and the coefficients effect which favours boys. This begs a policy question of why schools are not able to offset the gender inequality aspect from home variables.

The findings confirm Glewwe's (2002) advice to use the country context instead of aggregation of regions to draw concrete conclusions for policy makers for each country. The final contribution of this thesis is centred around the effect of school type on Egyptian students. This was investigated thoroughly in terms of schools' sex composition and school language of instruction. The research found a significant link between school type and student performance in Egypt; first, language schools appears to have better scores than Arabic schools. Second, single-sex schools do better than mixed schools (especially for girls). This last finding provides a partial explanation of the gender gap in Egypt which could not be determined from the decomposition analysis.

The detailed investigation of the factors affecting the learning outcomes in Egypt revealed many important findings; first the curriculum, and the teaching practices related to it, is a very influential determinant of the final output especially when we look to the learning components and how this is related to the future labour market. The effect of the number of books goes partially against Ammermuller et.al (2005)

where the effect of number of books found to increase achievements monotonically in Europe it is found that having many books has no effect on achievements in Egypt.

6.3 Future research

Future research should consider some questions related to the parallel education system, or what is known as the shadow education, which is based on private tutoring. This phenomenon is very common across MENA countries though no comparative data is available. The shadow education may be a major source of inequality if the families used it more to favour boys or girls to get better education or certain fields of study.

Another future research point would examine the progress and the discrepancies of country records on TIMSS studies. For example, Egypt participated in two rounds 2003 and 2007 between which there was a change on the number of years of primary education from 5 years at 2003 to 6 years at 2007. One could use to explore the difference between these two cohorts.

The low performance of the Gulf Cooperation Council (GCC) rich oil countries is a paradox worthy of further investigation. With high availability of funds and facilities for school resources, the poor performance across those countries is shocking.

Woessmann (2007) raised the argument about school autonomy and institutional reform and indicated more attention should be paid to these aspects in developing countries research. The public sector dominance and the static laws of bureaucracy in MENA countries limit school autonomy and education reform from the institutional perspective. This situation needs investigation.

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