Science Education Impacts on Labor Market and University Expectations of Students by Citizenship Status in the Kingdom of Saudi Arabia: a comparative analysis using TIMSS 2007 data

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ABSTRACT This study comparatively examines the impact of students’ citizenship status on science education relative to labor market and university expectations in the Kingdom of Saudi Arabia. Specifically, the 2007 Trends in International Mathematics and Science Study (TIMSS) provides science education teaching, learning and achievement data from the Kingdom of Saudi Arabia and each of the Gulf Cooperation Council (GCC) countries, including Bahrain, Dubai (United Arab Emirates), Kuwait, Oman and Qatar. Evidence suggests that the science knowledge and skills taught and learned in Saudi and other GCC schools contribute to the human capital of the students as future labor market participants and impact their future opportunity expectations relative to science. However, the results show that expectations and understanding of the labor market and university needs differ by students’ national and non-national citizenship status in Saudi Arabia, in particular.

Expatriate populations in Gulf countries surpass national citizen populations. This is a persistent topic of much concern to Gulf governments and business communities (Kapiszewski, 2001, 2006). Expatriates’ (also known as non-nationals) participation in Gulf economies has traditionally segmented the labor market by employment sector, skill level and salary (Fasano & Goyal, 2004). In fact, the non-national populations in most Gulf countries are dichotomized themselves by sector, skill and salary, with non-nationals either taking low-pay, low-skill service and labor-oriented jobs or high-pay, high-skill professional positions. Yet, as non-nationals increasingly fill private sector jobs in the Gulf, the labor market becomes less segmented by sector, skill and salary, and more segmented by citizenship status, with skilled and highly educated non-nationals frequently commanding top salaries in key private sector positions.

In order to bolster Gulf nationals’ participation in high-skill and high-salary positions, especially in the private sector, evidence and popular opinion increasingly point toward the development of human capital through science education as a key to improving Gulf nationals’ labor market participation (Bahgat, 1999; Fasano & Goyal, 2004; Ramirez et al, 2006; Karoly, 2010). The research reported here comparatively investigates the contributions and impact of science education on national and non-national student learning outcomes in the Kingdom of Saudi Arabia.
Science Education Impacts

(KSA) compared to regional peers in the Gulf and international trends. The differences in Saudi nationals' and non-nationals' knowledge and skills are also comparatively examined along with expectations for future higher education and labor market participation. This distinction in students’ citizenship status is a key element in the growing discourse about the relevance of global citizenship versus specific national citizenship.

The KSA is an important educational and labor market system in the Gulf because of its size, economic strength and historical significance both in the region and worldwide (World Bank, 2008). In particular, Saudi Arabia played a key role in establishing political, economic and social legitimacy in the Gulf throughout the twentieth century. The KSA, in particular, contributed to the rapid development of Gulf economic and political strength by bringing expatriate expertise to Saudi Arabia and the wider Gulf in education, business and technology. And, as Saudi Arabia now transitions from a natural resource-based economy to a more knowledge-based economy, the KSA is also leading efforts to build knowledge and skill capacity in the national population apart from the expatriates who helped the KSA establish itself during the era of rapid development (Kapiszewski, 2001; Hertog, 2012). As such, this research presents an evidence-based snapshot of the contribution that national educational systems make to students’ learning outcomes, higher education expectations and labor market potential in science in Saudi Arabia and the Gulf, given the marked distinctions in students’ national citizenship status.

Constructs and Definitions

The Gulf countries are increasingly implementing policies and programs geared toward nationalization of the labor force (Hertog, 2012). This is defined as Saudi-ization in Saudi Arabia, Emiratization in the United Arab Emirates, Omanization in Oman, and so on throughout the Gulf (see, for example, Al-Ali, 2008). Gulf labor force ‘nationalization’ agendas purportedly develop the knowledge and skills of Gulf national citizens, which it is argued will lead to higher national employment in high-skill and high-salary positions – often in the private sector. Inherent in this goal is the replacement of Gulf non-nationals (i.e. expatriates working in the Gulf) in these positions (Al-Waqfi & Forstenlechner, 2010).

Who constitutes the national and non-national populations in the Gulf countries, however, determines how labor market nationalization policies and programs operate. In Saudi Arabia, for example, there are specific limitations on who can receive citizenship to be a Saudi national. Saudi citizenship is only available if both of an individual’s parents are Saudi nationals. Expatriates from other countries are non-nationals, but so are those who were born in the KSA to one Saudi and one expatriate parent.

In Saudi Arabia, as in much of the Gulf, the public sector (i.e. government) employs the largest population of nationals. The public sector labor market includes work in education, many social services, the military or police force, and political government positions. In contrast, the private sector labor market is not government-sponsored and is largely profit-seeking. The private sector includes high-skill and high-salary positions as well as low-skill and low-salary service or construction positions. Nationalization movements in the Gulf are typically geared toward nationalizing high-skill and high-salary positions in the private sector.

Nationalization of the private sector, according to Saudi and Gulf policy makers, relies in large part on the development of a highly knowledgeable and highly skilled national workforce (Gonzalez et al, 2008). This requires the development of education for high-impact careers in science, technology, engineering and mathematics (STEM) for economic and labor market nationalization (Barber et al, 2007). Labor-market-related school policies, programs and curricula are expanding and becoming further institutionalized as Gulf states vie for economic, political and social legitimacy – regardless of their economic, political and social status or technical output (Wiseman, 2011). This is the case in Saudi Arabia.

Conceptual Framework

Human capital theory suggests that the more students are educated and the higher the level of education they attain, the more skilled and knowledgeable they will be – thus, the more they can
demand as exchange value for the knowledge and skills acquired during schooling (Becker, 1993; Gonzalez et al, 2008). Saudi employers – like those throughout the Gulf region and worldwide – assert that the Saudi educational system does not adequately prepare Saudi youth for labor market participation, especially high-knowledge, high-skill private sector participation (Alromi, 2001). This is juxtaposed with the fact that Saudi nationals and their Gulf national peers prefer high-status, high-job security, and guaranteed payment like that offered through the public sector (Alghofaily, 1980; Kisnawi, 1981). Therefore, the most frequent employment for Saudi nationals since the 1980s has been in the public rather than the private sector.

Much work has been dedicated to the description and analysis of citizenship and the employment sector in the Gulf Cooperation Council (GCC) countries (Central Department of Statistics and Information, 2007; Harry, 2007; Baldwin-Edwards, 2011; Hertog, 2012), although it is not as often published in the scholarly literature written in English as it is elsewhere. However, Shah (2012, p. 142) compiled historical data on ‘native and foreign components of GCC labour forces’, which describes the percentage of the labor force in each GCC country that is non-national in 5-10-year increments from 1975 until 2008. The percentage of non-nationals in the total labor force is high throughout the Gulf (Fergany, 2001), with Saudi Arabia posting the lowest percentage of employed non-nationals and Qatar posting the highest.

In 2008, the percentage of the labor force that was non-national in each of the GCC countries was as follows: Bahrain = 76.7%; Kuwait = 83.2%; Oman = 74.6%; Qatar = 94.3%; Saudi Arabia = 50.6%; and United Arab Emirates = 85.0% (Shah, 2012, p. 142). The overall GCC percentage of non-nationals in the labor force was 66.9%. It is also worth noting that, over time, the percentage of non-nationals in the labor force has increased in all GCC countries except for Saudi Arabia. In fact, since 1985, the percentage of non-nationals employed in Saudi Arabia has decreased (Kapiszewski, 2001; Shah, 2012).

As the number of non-nationals in the GCC labor markets has risen over time (except in Saudi Arabia), and nationalization policies and public discussions have increased as a result, the role of education and youth in reversing the non-national labor market population has been increasingly highlighted (Chapman & Miric, 2009; Wiseman, 2011). However, there is relatively little empirical research that investigates Saudi or GCC national youth potential to productively participate in the labor market, especially in high-skill, high-salary and private sector positions. Since much of the emphasis on youth preparation for labor market participation is based on STEM education and economic expectations (Ramirez et al, 2006), education reform related to STEM is particularly relevant to the discussion (Hanushek & Kimko, 2000).

The Gulf countries’, and particularly Saudi Arabia’s, educational plans and reforms reflect the growing importance of STEM education for potential labor market participation and knowledge economy development (Bahgat, 1999). For example, as early as the Fourth Plan for Educational Development (1985-90), the General Administration for Educational Technology (GAET) was established, which was tasked with overseeing the integration of technology in the KSA’s schools. The first of these schools – developed high schools – incorporated eight credit hours in the existing curriculum focused on computer use, programming and information systems (Al-Sulaimani, 2010). The developed high school program was abandoned in 1990 due to a lack of available technology resources, and the curriculum was replaced with a general computer class requirement. Yet, the GAET continues to support the integration of technology resources and curricula in secondary schools and higher education (Alsebail, 2004).

In 1988, the Ministry of Education established the Directorate General for Educational Technology (Janio, 2007). Two administrative departments were created as part of the Directorate General: the Design Department and the Production Department. These administrative divisions were tasked with supplying schools with educational technology resources, attended to the design and production of educational materials, and emphasized training Ministry of Education and district senior staff in information and communication technology teaching and equipment use (Janio, 2007).

The Fifth Plan for Educational Development (1990-94) increased funding for public education in the KSA in response to an increase in the number of school-aged children. Funding for the Fifth Plan exceeded its original budget of $40.8 billion by 18% (Janio, 2007). The Ministry of Education’s rationale for increasing the funding was that public schools were necessary to increase the human capital of Saudi Arabia. The Sixth Plan for Educational Development (1995-2000) expanded the
government’s commitment not only to fund public education, but also to increase the use of advanced technology and update related teaching and curricula (Janio, 2007).

The King Abdullah Public Education Development Project (Tatweer project) was developed as a five-year initiative (2008-12) by the Ministry of Education to revive the reform efforts related to the KSA’s public schools. The foundation of the reform was grounded in the human capital benefits associated with education as a predictor of national development and global social and economic participation. The vision of the project at that time was to create a world-class and self-sustaining knowledge workforce that could compete effectively at the global level. Building on prior reform initiatives in the KSA, the Tatweer project aimed to create a new framework for teaching and learning which would contribute to both individual and national economic development.

**Labor Market Aspirations and Expectations**

There is little empirical research that investigates Gulf students’ aspirations and expectations for post-secondary higher education or labor market participation (Harry, 2007; McLean, 2010). Information like this could inform policy makers concerned with the relationship between youths’ citizenship status, academic performance, and expectations for future higher education and labor market participation. What little research there is on youths’ attitudes on and expectations for their future labor market participation crosses the literature from several disciplines and theoretical perspectives (Albert & Luzzo, 1999), but none of it compares youths’ expectations by citizenship status or employment sector. The relevant empirical research that does exist falls into several categories, including work ethic, academic achievement, expectations versus reality, and labor market preparation in school (Gonzalez et al, 2008). Some studies suggest that simply working hard in school is the key to labor market success, even though empirical evidence suggests that effort is not a significant predictor of labor market productivity (Lowe & Krahn, 2000).

Prior research suggests a relationship between youths’ educational expectations and their labor market aspirations (Worth, 2002). Thus, while gender, race and class continue to be strong influences on youths’ attitudes toward their educational attainment, achievement and expectations for future labor market participation, research suggests that there are relationships among attainment, achievement and labor market expectations which associate apart from the ubiquitous impact of gender, race and class (Lent et al, 1991). In fact, some have found that academic achievement is a better predictor of career self-efficacy than even gender, which has traditionally been one of the strongest predictors of both academic and labor market performance (Kelly, 1993).

Even when youths’ academic achievement or attainment does not match their background (for example, high-status youths who perform below expectations), evidence suggests that those youths eventually develop aspirations which match their achievement or attainment levels (Jacobs et al, 1991). In other words, the higher GCC nationals perform academically, the more likely they are to have high expectations for higher education and labor market participation, and vice versa. The question for GCC educators and policy makers is whether citizenship status is a significant predictor of youths’ higher education and labor market expectations, and potential participation or productivity in either.

**Data and Methods**

The 2007 Trends in International Mathematics and Science Study (TIMSS) is the primary data source for the analyses below, which investigate the impact of science education on the labor market and university expectations of Saudi youth. TIMSS 2007 contains data from 59 countries, which includes approximately 500,000 students (Olson et al, 2008). Although TIMSS includes data for both fourth- and eighth-grade equivalent samples, the data used in these analyses is for eighth-grade equivalent students, teachers and schools only. Eighth graders responded to background questionnaire items specifically about their university and labor market expectations related to science. Science achievement data as well as questionnaire data for the participating students, classroom teachers and principals contribute to the analyses.

Nationally representative samples from each participating TIMSS country and benchmarking community, including Saudi Arabia, were determined using a two-stage sampling design (Olson et
al., 2008). The first stage consisted of a probability-proportionate-to-size sample of schools selected from a sampling frame of all schools in that nation enrolling most of the students in the targeted grade level. The second stage sampled up to two science classrooms per school with an equal probability of selection, and all students in these classrooms were included in the study. The study developers provided sampling weights to adjust for disproportional sampling of subgroups and non-response (Olson et al., 2008).

The science achievement tests as well as background questionnaires for students, teachers and principals were designed to be comparable across nations. The analyses reported here compare national versus non-national student science achievement, learning conditions and background characteristics at both the student and school levels. The different indicators used in the analyses may be summarized as follows:

**Student-Level Indicators**

- **Both Parents Born in the Country (NATIONAL)** is an indicator of students’ national citizenship status, which measures whether a student’s mother and father were both born in Saudi Arabia (or the country where the test was given). It is a dummy variable (KSA sample mean = 0.99; KSA sample standard deviation [SD] = 0.41, where 1 = both parents born in the country and 0 = only one or neither parent born in the country).

- **Science Achievement Score (BSSSCI01)** is each student’s TIMSS score on an achievement test designed to capture a range of science knowledge and skills appropriate to the curriculum at the targeted grade level (KSA sample mean = 410.82; KSA sample SD = 78.81). It is included in our analyses as both the dependent variable and as one of the predictor variables for science-related job and university expectations.

- **Science-Based Job Expectation (SCIJOBEX)** is a dummy variable indicating students’ strong agreement that they need to do well in science to get the job they want (KSA sample mean = 0.64; KSA sample SD = 0.48). This indicator is included in our analyses as both a dependent and an independent variable in different models.

- **Science-Based University Expectation (SCIUNIEX)** is a dummy variable indicating students’ strong agreement that they need to do well in science to get into the university they want (KSA sample mean = 0.65; KSA sample SD = 0.48). This indicator is included in our analyses as both a dependent and an independent variable in different models.

- **Female (FEMALE)** is dummy coded (1 = female; 0 = male), indicating students’ sex (KSA sample mean = 0.53; KSA sample SD = 0.50).

- **Language of Test Spoken at Home (LANGUAGE)** is an indicator of whether the language of the test is the same language students speak at home. It is dummy coded (1 = always; 0 = sometimes, rarely and never). For a study dealing with the impact of national status on science education and expectations for a job and university, language is a potential indicator of non-national citizenship status as well (KSA sample mean = 0.70; KSA sample SD = 0.46).

- **Books in the Home (BOOKS)** is a categorical measure of the number of books each student reports having in the home.

**School-Level Indicators**

- **Economic Disadvantage of Community (ECONDISA)** is an indicator of the degree of economic disadvantage in a school community as estimated by the school principal or head administrator (KSA sample mean = 2.32; KSA sample SD = 1.04, where 1 = least economically disadvantaged and 4 = most economically disadvantaged).

- **Shortage of Science Resources (SCIRESSH)** is an indicator of the degree of shortage of instructional resources for science education in a school as estimated by the school principal or head administrator (KSA sample mean = 1.96; KSA sample SD = 0.48, where 1 = high resources and 3 = low resources).

- **Female School (FEMALE_M)** is an indicator of whether a school is predominantly female or not. It is a school aggregate proportion based on students’ individual reported sex (KSA sample mean = 0.50; KSA sample SD = 0.50). Since schools are completely single sex in Saudi Arabia, this
contextual indicator accounts for school-level variation due to this unique Gulf educational system characteristic.

Methodologically speaking, estimating effects using nested national survey data necessarily involves multilevel, multivariate statistical modeling such as hierarchical linear modeling (HLM) that incorporates school-level variables into estimates of individual models (Raudenbush & Bryk, 2002). The analyses reported here began with univariate and bivariate analyses at the nation level to describe cross-national trends in differences between national and non-national students in terms of achievement and other performance indicators. Using this information, the analyses progressed to correlations, t-tests and analysis of variance (ANOVA) in order to determine the degree of association and significance of differences in science achievement score or labor market and university expectations by national/non-national status. Finally, multilevel regression models using HLM were conducted to determine the impact of students’ citizenship status on their science achievement score or labor market and university expectations controlling for other background and learning environment characteristics.

Hierarchical linear regression models estimate the multilevel and contextual effects of citizenship status on student achievement and science-related labor market and university expectations. HLM is especially appropriate in the context of nested data such as the TIMSS data provides (Raudenbush & Bryk, 2002). Here, this is applied to student-level effects nested within school contexts. For the eighth-grade KSA sample in TIMSS 2007, separate models are estimated for each indicator of national status related to science achievement score, science-related labor market expectations or science-related university expectations. The object is to estimate the effect of cross-national variation in citizenship status on science performance while holding constant labor market and university expectations.

The first-level equation (eq. 1) estimates the influence of a student’s citizenship status ($\beta_1$), science-based job expectation ($\beta_2$), science-based university expectation ($\beta_3$) and, for control of background effects, three indicators of the student’s individual and family background ($\beta_4$, $\beta_5$, and $\beta_6$). The following example equation assumes students’ science score as the dependent variable (Model 1), although, in two different hierarchical linear regression models, expectations for the labor market (Model 2) and university participation (Model 3) are each substituted for the dependent variable, and students’ science achievement score becomes an independent variable.

$$Y_{ij} = \beta_0 + \beta_1(NATIONAL)_{ij} + \beta_2(SCIJOBEX)_{ij} + \beta_3(SCIUNIEX)_{ij} + \beta_4(FEMALE)_{ij} + \beta_5(LANGUAGE)_{ij} + \beta_6(BOOKS)_{ij} + \epsilon_{ij}$$

(eq. 1)

$Y_{ij}$ is the dependent variable (for example, science achievement score) for the $i^{th}$ student within school $j$; $\beta_0$ is an estimate of the adjusted mean dependent variable for school $j$; and $\epsilon_{ij}$ is a student-level residual. By assumption, $E(\epsilon_{ij}) = 0$ and $\text{Var}(\epsilon_{ij}) = \sigma^2$.

For the school-level equation (eq. 2), the mean dependent variable ($\beta_0$) is modeled as a function of school characteristics ($\gamma_{00}$, $\gamma_{01}$ and $\gamma_{03}$) as follows:

$$\beta_0 = \gamma_{00} + \gamma_{01}(ECONDISA)_0 + \gamma_{02}(SCIRESH)_0 + \gamma_{03}(FEMALE_M)_0 + u_{0j}$$

(eq. 2)

Here, $\gamma_{00}$ is an estimate of the adjusted school mean dependent variable and $u_{0j}$ is a school-level residual. By assumption, $E(u_{0j}) = 0$ and $\text{Var}(u_{0j}) = \tau_0$. Each model and equation was run separately for each GCC country or benchmarking community.

Science Education Differences among Nationals and Expatriates in GCC Countries

The results of our cross-nationally comparative descriptive and interpretive analyses show that students born in Gulf countries to expatriate parents (not born in the country) are the highest achieving in both mathematics and science. Figure 1 shows the eighth-grade science achievement scores by GCC country and parents’ origin. We also conducted an ANOVA for each country’s results, which indicate significant differences ($p < .001$) between the achievement means by parent origin (i.e. citizenship status) in Saudi Arabia and each individual GCC country, as well as for the
There is interesting variation in the science achievement scores by national origin as well. In Saudi Arabia, non-national students with neither parent born in the country have the highest science achievement score (mean = 426.6), and non-national students with only one parent born in the country have the lowest science achievement score (mean = 387.3). National students whose parents were both born in the country score in between these two non-national groups (mean = 403.1). In fact, this pattern is seen in the GCC mean and is repeated in each GCC country except for Oman and Qatar. However, the international sample from TIMSS shows a different pattern. In the international mean, national students score the highest, followed by one-parent non-nationals and then neither-parent non-nationals. Interestingly, the non-national students when averaged all together (both one and neither parent born in the country) score higher in eighth-grade science achievement than all the national students.

Bivariate correlation results show that when students’ parents are both born in the country (i.e. are citizens of a Gulf nation), the parents’ education level tends to be lower ($r = -0.111; p < .001$). Gulf students’ science achievement scores are positively associated with parents’ education level ($r = 0.337; p < .001$). Also, higher-achieving students are more likely to have non-national parents. This is supported by results showing a significantly negative relationship between parents born in the country and science achievement ($r = -0.136; p < .001$). These findings are reflected in the results for Saudi Arabia and all other TIMSS-participating GCC countries. Next, we consider the contextual effects of majority national versus non-national schools.

Table I shows eighth-grade science achievement by country and national versus non-national majority schools. The data represented in this table shows the average achievement of national students (both parents born in the country) compared to non-national students (one or neither parent born in the country) within school contexts that are either national or non-national majority. This is important to estimate because in several GCC countries, schools with a majority of non-national students are separate from schools where the majority of students are GCC nationals. We have estimated the average science achievement scores within these two contexts because of the possibility that national and non-national students were grouped together by
citizenship, neighborhood or community, and it was perhaps possible that the contextual effect was being measured rather than the effect of a student’s national status.

<table>
<thead>
<tr>
<th>Country</th>
<th>National Student Mean</th>
<th>Non-National Student Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>National Majority Schools</td>
<td>Non-National Majority Schools</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>403.6</td>
<td>419.3</td>
</tr>
<tr>
<td>Bahrain</td>
<td>470.9</td>
<td>475.3</td>
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<tr>
<td>Kuwait</td>
<td>416.9</td>
<td>409.2</td>
</tr>
<tr>
<td>Oman</td>
<td>418.9</td>
<td>406.5</td>
</tr>
<tr>
<td>Qatar</td>
<td>304.9</td>
<td>355.0</td>
</tr>
<tr>
<td>Dubai (UAE)</td>
<td>430.9</td>
<td>463.7</td>
</tr>
<tr>
<td>GCC Mean</td>
<td>411.7</td>
<td>414.9</td>
</tr>
<tr>
<td>Int’l Mean</td>
<td>498.6</td>
<td>484.4</td>
</tr>
</tbody>
</table>

Table I. Eighth grade science achievement by country and national versus non-national majority schools (TIMSS, 2007).

As Table I shows, there is little difference between Saudi national students’ science achievement in national versus non-national citizenship majority schools, but a significant difference between non-national students in these different contexts. In particular, Saudi non-national students performed at significantly higher levels within a non-national majority context school than within national majority context schools. T-tests confirm the statistical significance of these differences ($p < .001$). In this respect, Saudi Arabia and Oman are the most similar. This is a unique finding which suggests that there is consistency in the impact of national status on students’ science performance regardless of school context, but that non-national students in Saudi Arabia are either limited in national majority schools or somehow encouraged in non-national majority schools.

Table II shows the science-based university expectations for eighth-grade students by country and parents’ origin (national citizenship status). The means for each of these categories represent the level of agreement students have with the statement: ‘I need to do well in science to get into the university of my choice’. Means between 1 and 2 indicate that students agree or strongly agree with this statement; 2 and 3 that students neither agree nor disagree; and 3 and 4 that students disagree or strongly disagree. As Table II shows, students in all GCC countries agree with this statement. Because of the way this variable is coded, lower means indicate that students agree more.

<table>
<thead>
<tr>
<th>Country</th>
<th>National Student Mean</th>
<th>Non-National Student Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>National Majority Schools</td>
<td>Non-National Majority Schools</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2990</td>
<td>1.57 0.89</td>
</tr>
<tr>
<td>Bahrain</td>
<td>3106</td>
<td>1.52 0.86</td>
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<tr>
<td>Kuwait</td>
<td>2907</td>
<td>1.49 0.84</td>
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<tr>
<td>Oman</td>
<td>3822</td>
<td>1.45 0.74</td>
</tr>
<tr>
<td>Qatar</td>
<td>3850</td>
<td>1.72 0.95</td>
</tr>
<tr>
<td>Dubai (UAE)</td>
<td>646</td>
<td>1.65 0.87</td>
</tr>
<tr>
<td>GCC Mean</td>
<td>17493</td>
<td>1.55 0.86</td>
</tr>
<tr>
<td>Int’l Mean</td>
<td>119301</td>
<td>1.81 0.93</td>
</tr>
</tbody>
</table>

Table II. Eighth grade science-based university expectation by country and parents’ origin (TIMSS, 2007).

The Saudi data in Table II shows that, regardless of national citizenship status, students agree with this science-based university expectation statement at roughly the same level. Compared to the
GCC mean, Saudi nationals agree slightly less that they need to do well in science to get into the university of their choice, whereas non-nationals in Saudi Arabia tend to agree with this statement slightly more. Overall, however, Saudi nationals and non-nationals do not have significantly different expectations about science and university participation. In other words, Saudi non-national students have relatively similar expectations to Saudi national students related to the importance of science for university entrance.

Table III shows the science-based job expectations for eighth-grade students by country and parents’ origin (citizenship status). The means represent the level of agreement students have with the statement: ‘I need to do well in science to get the job I want’. As with the previous expectation indicator, means between 1 and 2 indicate that students agree or strongly agree with this statement; 2 and 3 that students neither agree nor disagree; and 3 and 4 that students disagree or strongly disagree. As in Table II, the data in Table III shows that students in all GCC countries agree with this statement. Those with lower means agree more.

<table>
<thead>
<tr>
<th>Country</th>
<th>Both Parents Born in Country</th>
<th>Only One Born in Country</th>
<th>Neither Born in Country</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi Arabia</td>
<td>3069 1.63 0.93</td>
<td>381 1.64 0.96</td>
<td>543 1.55 0.88</td>
<td>1.45</td>
</tr>
<tr>
<td>Bahrain</td>
<td>3116 1.49 0.86</td>
<td>405 1.50 0.80</td>
<td>557 1.51 0.86</td>
<td>0.11</td>
</tr>
<tr>
<td>Kuwait</td>
<td>2922 1.50 0.86</td>
<td>489 1.64 0.98</td>
<td>390 1.54 0.89</td>
<td>6.09 **</td>
</tr>
<tr>
<td>Oman</td>
<td>3823 1.34 0.69</td>
<td>469 1.48 0.82</td>
<td>303 1.40 0.75</td>
<td>7.77 ***</td>
</tr>
<tr>
<td>Qatar</td>
<td>3872 1.75 1.00</td>
<td>1023 1.75 1.03</td>
<td>1885 1.53 0.88</td>
<td>33.41 ***</td>
</tr>
<tr>
<td>Dubai (UAE)</td>
<td>649 1.81 1.00</td>
<td>326 1.90 1.05</td>
<td>1675 1.79 0.97</td>
<td>1.40</td>
</tr>
<tr>
<td>GCC Mean</td>
<td>17633 1.55 0.89</td>
<td>2986 1.66 0.97</td>
<td>5288 1.62 0.92</td>
<td>23.97 ***</td>
</tr>
<tr>
<td>Int’l Mean</td>
<td>119400 1.93 1.00</td>
<td>13731 1.97 1.04</td>
<td>15970 1.92 1.00</td>
<td>10.49 ***</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

The Saudi data in Table III shows that students with both or one Saudi parent agree with this science-based job expectation statement less than Saudi non-nationals with neither parent born in the country. While our ANOVA shows that there is no significant different (p < .05) among the mean responses for each national/non-national category of student, the mean response coefficients show that on average non-nationals with neither parent born in the country are more likely to expect that science is important for getting the job they want. In other words, non-national students expect the link between science and the labor market to be stronger than nationals or non-nationals with one Saudi parent. In our multilevel analysis below, we limit this indicator to only those students who strongly agree that science is important to getting the job they want, which is a better indicator for distinguishing strong expectations from general agreement.

The results of our descriptive and comparative analyses described thus far suggest that Saudi Arabian students’ science achievement can be estimated by national status (specifically, a negative impact of national status) and that there is a significant impact of parents’ versus students’ non-national status, with non-national children of ‘expatriate’ parents being the highest achievers. Our multilevel analyses, however, provide a method for statistically controlling for contextual effects and other independent variables that impact the relationship between science achievement, citizenship status, and both labor market and university expectations.

Table IV shows the results of our multilevel regression analysis. Specifically, these results demonstrate the impact of Saudi students’ national citizenship status on science achievement and future science-related expectations. Three models were estimated using three different dependent variables, as indicated in each of the three columns: science achievement score (Model 1, BSSSCI01), science-based job expectation (Model 2, SCIJOBEX) and science-based university expectation (Model 3, SCIUNIEX).
Each dependent variable was regressed on the indicator of a student’s citizenship status being Saudi (NATIONAL), which is the primary indicator of interest for this study. We included many contextual and control factors at both the student and school levels in order to isolate the impact of a student’s national status as much as possible. The results show that a student’s national citizenship status in Saudi Arabia has a small but significantly negative impact on science achievement and science-based university expectations, and no significant impact on science-based job expectations. This supports our findings from the descriptive and comparative analyses.
reported above, and indicates that Saudi nationals are at a disadvantage compared to non-nationals in terms of science achievement and expectations for both the labor market and university. This is, in many ways, a reflection of Saudi culture and the traditional lack of emphasis on both private sector employment and the importance of education for an individual’s future education and employment (Wiseman & Alromi, 2007).

Another interesting result of these multilevel regression models is the impact that a student or school being predominantly female has on labor market and university expectations. The strength and direction of impact are reversed at the student and school levels for females. Being situated in a female context at the school level has no significant impact on science achievement, but a female Saudi student’s science-based expectations for getting the job she wants are both a positive and significant predictor of science achievement ($\beta = 22.05; p < .001$). This suggests that individual female students have strong expectations that science will help them get the job they want in the future. However, the contextual effect of a female school in Saudi Arabia posts a negative and significant impact ($\beta = -0.48; p < .001$) as a predictor of students’ science-based job expectations. This suggests that students in all-girl schools (which is all-female schools in Saudi Arabia) have a lower expectation for science-based jobs than they do when measured as individuals.

The implications of this finding are that individual female Saudi students have a more positive expectation that what they learn in science in school contributes to their labor market chances than is perhaps the normed expectation in girls’ schools in general. Conversely, individual Saudi female students have a negative and significant expectation about science and university admission ($\beta = -0.68; p < .001$), but collectively within all-girl schools there is a positive and significant result ($\beta = 0.64; p < .001$). This suggests that the connection between school science and science-related university attendance is weak among individual female students, but stronger in all-girl schools collectively.

**Conclusion**

The research reported here shows how international educational data can be used to both test and estimate the impact of students’ national citizenship status on their current academic achievement, as well as their estimated future economic and educational potential. The key context for this analysis is the nationalist-oriented expectations in education and other socio-economic arenas in the Gulf and, specifically, in Saudi Arabia. As these policies, programs and curricula for nationalizing the labor market participation of Gulf nationals expand, the significance of labor market outcomes (intended or actual) continues to decrease. The outcomes of Gulf nationalization efforts become less important as their existence becomes more organizationally important. In other words, once institutionalized, work-related school policies, programs and curricula continue to expand and be legitimized regardless of their actual technical output or original incentives (Meyer, 1977; Meyer & Rowan, 1977). This context is the product of a history of importing knowledge and service workers in Saudi Arabia and the Gulf region over a multi-decade period of rapid development in the twentieth century.

Although both perceived and evidence-based expectations concerning the differences between national and non-national students suggest some educational disadvantage for non-nationals, the analyses reported here show quite the opposite. Instead, the Gulf region may be unique worldwide in that, although there is often a perceived disparity between national and non-national students, the evidence suggests that non-national students perform at significantly higher levels with a greater expectation of future labor market and higher education participation as a result of their science education. This perhaps confirms pro-nationalist warnings in Saudi Arabia and other Gulf states about the perceived economic disadvantages that non-nationals pose toward Gulf national citizens (Al-Dosary & Rahman, 2005), but also suggests that, educationally, there is a significant difference between national and non-national youth performance and future labor market potential which deserves continued investigation.

The results of the analyses presented here provide an evidence base for policy makers and both public and private sector employers to understand the contribution of education to science knowledge and skill capacity among Gulf national citizens. Furthermore, this data may support a competitive economic environment for Saudi nationals in higher education, the private sector and
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beyond. More broadly, the global citizenship discourse, which has become increasingly legitimized in the late twentieth and early twenty-first centuries, may not be as relevant in the Gulf countries. The evidence presented here suggests that this may be because of the decades-long history of importing non-national citizens as knowledge workers, which is now the backdrop for a new agenda to reassert the status of national citizens in educational and labor market systems across the Gulf.

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Note

[1] Item response theory scale scores were estimated for each student based on an imputed plausible value analysis undertaken by the TIMSS study. Five plausible values per student were estimated. After extensive preliminary analysis, no substantial differences among the results were found using individual versus integrated values; therefore, the first plausible value is used in some but not all of the analyses reported here.

References


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