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Building Citizens for the Arab Knowledge Economy

Evidence from the United Arab Emirates

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Contents

Executive Summary	7
Introduction	8
Theory	9
Background on UAE Education	12
Research Methodology	15
Survey Design and Measurement	17
Results and Discussion	19
Figure 1: Achievement Motivation	19
Figure 2: Nationalism	20
Figure 3: Pride in the UAE	21
Figure 4: Civic-mindedness	21
Figure 5: Willingness to Take Risks	22
Figure 6: Willingness to Invest	22
Figure 7: Social Capital	23
Figure 8: Job Priorities	24
Figure 9: Importance of Respect and Parents' Expectations	25
Figure 10: Values	26
Figure 11: Love of Country and Determination	26
Conclusions and Policy Implications	28
Bibliography	30



Executive Summary

This working paper presents the results of an intensive case study of education reform to support the development of a post-petroleum, knowledge-based economy in the United Arab Emirates (UAE). The case study is part of a larger research project exploring the ways in which state leaders may cultivate engaged citizens who are willing and able to contribute to the development of their countries, particularly in the contemporary era of heightened globalization and intense economic competition. Building on existing theory and empirical work, the case study identifies and measures attitudes that are believed to facilitate knowledge-intensive growth within one country, such as achievement motivation, risk-taking propensity, civic duty, willingness to invest in a promising business idea, trust, and social capital. For both policymakers and researchers, the case study offers a rich portrait of one strategy that state leaders may use to help foster knowledge-intensive economic development.

The case study uses a quasi-experimental research methodology that compares UAE students' attitudes in a new type of school ("treatment" schools) with UAE students' attitudes at regular government schools ("control" schools). The new type of school has been developed as part of the country's larger movement of education reform to support a post-petroleum, knowledge-based economy. The working paper presents findings on the major differences between students' attitudes at the two types of schools and uses a difference-in-differences (DD) approach to estimate the causal effect of the treatment schools on students' attitudes in these areas.

Key findings include:

- Students in the treatment schools reported significantly higher levels of achievement motivation, willingness to take risks, willingness to invest in a promising business idea, and social capital, compared with students in regular government schools.
- Students in the treatment schools reported significantly higher levels of civic-mindedness relative to students in regular government schools.
- Positive, significant DD estimates of the causal effect of treatment schools on students' levels of nationalism and pride in the UAE were also found, suggesting that treatment schools are successfully promoting these types of attitudes in UAE youth.
- Respect from friends and personal interest, or "a job I like," were students' highest priorities in selecting a job across both types of schools; treated students consider "contributing to UAE society" almost as important.
- The data suggest that treatment schools are increasing the degree to which UAE youth value determination and perseverance, based on positive and significant DD treatment effect estimates for these variables.

Introduction

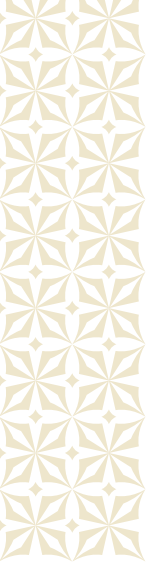
Rapidly developing, resource-rich Gulf monarchies like the United Arab Emirates (UAE) are pioneers of innovation in the Arab world. As power shifts toward areas in the world that succeed in fostering knowledge-based economies, these early adopters may be seen as models in how to harness the benefits of globalization and cultivate a knowledge renaissance, without social and political instability.¹ With the advantages of wealth, small populations, and progressive leadership, the small Gulf states are able to experiment with different strategies to nurture young talent, promote innovation, and encourage a more entrepreneurial culture. Yet systematic knowledge about the range of strategies underway and their role in helping to achieve these larger aims is limited. While a growing body of policy-relevant literature explores obstacles to reform and areas for potential improvement, including teacher training, curriculum development, technology availability, and gender equity, research is needed to connect the dots in achieving longer-term goals.² Policymakers would benefit from a broader, more holistic perspective, using data on the ground and rigorous research methodologies to link local educational initiatives with national grand strategies.

This working paper aims to support policy development in these areas by sharing the results of an intensive case study in education reform for the knowledge economy in the UAE. The case study examines how a public school reform affects students' attitudes in areas important for knowledge-intensive economic development, anchored in the UAE and driven by Emiratis. These include achievement motivation, nationalism, pride in the UAE, civic-mindedness, social capital, willingness to take risks, willingness to invest in a promising business idea, job priorities, and values. To identify how the school reform affects attitudes, the study uses a quasi-experimental methodology comparing students' attitudes across "control" and "treatment" schools as well as younger and older grade cohorts ($n = 4,714$). A difference-in-differences (DD) approach is also used to generate estimates of the effect of the school reform on students' attitudes. Because the methodology includes students involved in the school reform as well as students at regular public schools, and measures their attitudes across grade cohorts, it removes selection bias and controls for over-time factors that may also affect these attitudes, such as age, maturation, and social context. As a result, the effects of the school reform on students' attitudes can be estimated more effectively. The sample included students surveyed at seven treatment schools and thirteen control schools in 2011.

The working paper is organized as follows. First, it discusses theory and hypotheses about how different types of education may affect attitudes relevant for knowledge-intensive economic

¹ In this paper, the terms "knowledge economy," "knowledge-based economy," and "knowledge-intensive economic development" are used interchangeably to refer to economic development deriving especially from innovation, entrepreneurship, and advances in science and technology. The interest in knowledge-intensive economic development has emerged from a growing consensus that knowledge is playing an increasingly important role in economic growth (Drucker 1969; Bell 1973; Christensen 1997; Kao 2007). In economic theory, the idea can be traced to the work of Joseph Schumpeter and later models of endogenous growth or "new growth" theory, which emphasize human capital and innovation; a useful review can be found in Romer (1994). Although state leaders and international organizations have now embraced the idea and it has accordingly become a policy buzzword, critics argue the scholarly literature lacks a theoretically precise definition for these terms (Powell and Snellman 2004; Robertson 2005).

² See, for example, Gonzalez, Karoly, et al. 2008.



development. Next, it provides the general context of UAE education and describes the nature of the treatment schools in the sample: they are a new type of public secondary school initially called the Institute of Applied Technology (IAT) and now known as the Applied Technology High School (ATHS). Third, it presents the research methodology, a quasi-experimental approach in which students' attitudes at the new schools ("treatment" schools) are compared to students' attitudes at regular government schools ("control" schools). To estimate causal effects, a difference-in-differences (DD) strategy is used. The final section offers conclusions and policy implications of key findings.

These findings should be valuable for several reasons. First, for practitioners and strategists, the case study offers analysis of one type of strategy that state leaders may use to help foster knowledge-based economic development. Gulf state leaders' willingness to experiment with different educational initiatives provides an extremely valuable opportunity to build cross-cultural knowledge in these globally important areas. At a time of heightened global economic competition when many state leaders are pursuing strategies of innovation and knowledge-intensive growth, such research is especially valuable. Second, for scholars, the study may help address gaps in existing theory about citizenship-building, innovation hotspots, and the role of education reform in national grand strategy, since most of the literature in these areas draws from Western historical experiences.

Theory

A rich literature in history, philosophy, and the social sciences testifies to the role of education in developing young citizens' attitudes and values, in addition to skills and knowledge levels. Unfortunately, however, only a limited portion of this literature addresses how different types of education affect attitudes relevant for knowledge-intensive economic development, or indeed, economic attitudes more broadly. At the same time, while the "school effects" literature has explored the relationship between education and economic development, it tends to focus less on attitudes as dependent variables than on test scores, earnings, and other material outcomes (Hallinan 2000; Altonji, Elder, et al. 2005). Yet education is widely known to be a powerful mechanism for socialization: like the family and home environment, it helps shape young people's attitudes in important ways that may persist over the lifetime. In the contemporary era of heightened globalization and intense economic competition, the question of how differing types of education may prepare citizens to contribute to national development through hard work, innovation, and civic duty is likely to attract greater research and policy attention.

Within the literature, several findings are relevant in the development of strategies to foster a knowledge-based economy with willing and able citizens to engage in it. While the effects of education on attitudes in these areas may vary according to a wide range of variables, including the type of education, degree level, quality of teaching and learning, cultural background, and individual student characteristics, some general findings are relatively well-established. For example, strong evidence links "modern" education, as compared to traditional approaches to education that emphasize rote learning, to changes in economic aspirations. Research suggests that modern education can raise individual achievement motivation, create heightened

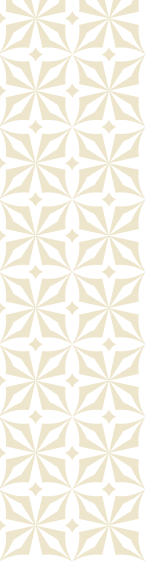
appreciation for knowledge, and build self-confidence in the ability to thrive in competitive environments, potentially jumpstarting economic growth (Deutsch 1961; McClelland 1961; Shipman 1971; Szyliowicz 1973; Gellner 1983; Inglehart 1997).

In one of the most influential contributions to this literature, *The Achieving Society*, David McClelland (1961) presented cross-national empirical evidence of a link between rates of economic growth and the extent to which school curricula motivate students to think creatively and achieve at higher levels. While the implications and interpretation of this research are contested, it has inspired a wide literature seeking to clarify the intricate processes linking education, culture, attitudes, and economic development. In their recent review of the literature on higher education, for example, Pascarella and Terenzini (2005) conclude that college, in particular, encourages a higher individual motivation to achieve as well as more diverse career interests. Turning to broader worldviews, Hainmueller and Hiscox (2006) find that higher education increases individuals' support for trade liberalization and open competition in the global economy. A growing community of scholars and practitioners are also examining how specific educational initiatives affect interest in knowledge-driven economic development in the heightened competitive context of globalization, especially through high-tech entrepreneurship and innovation (Souitaris, Zerbinati, et al. 2007; Athayde 2009).

At the same time, an important tradition in the sociology of education highlights the limits of education in affecting aspirations related to economic mobility (Bowles and Gintis 1976; Willis 1981; MacLeod 1987; Bourdieu 1996). For example, theorists such as Bourdieu and Weber have argued that education tends to reinforce social hierarchies, perpetuating the power of a dominant class in various ways. Far from raising achievement motivation, then, so-called "modern" education may foster obedient workers who "know their place" in society and thus do not develop higher-level career aspirations. Bowles and Gintis (1976), Willis (1981), and MacLeod (1987) have shown in more empirical detail how this process can take place, especially in low-income neighborhoods, challenging the standard conception of modern education. Weber has gone so far as to suggest that the certificates and credentials associated with modern education may be playing the same role that "proof of ancestry" played in earlier eras, serving the "formation of the privileged stratum in bureaus and offices" and producing expectations of a "status-appropriate" salary as opposed to one based on performance (Weber 1978, 1000). Evidence for this view can also be found in *The Credential Society*, a well-known work by Randal Collins (1979).

Recent advances in methods of empirical data collection and analysis have allowed scholars to enrich theory with more precise investigations of the processes linking attitudes, values, culture and other non-material variables with economic outcomes.³ One of the most promising areas of

³ Although it is outside the scope of this paper, there is a lively debate in the development economics literature over whether and how culture affects economic outcomes, given that it can be difficult to measure and efforts to illustrate its causal influence are plagued by problems of endogeneity and reverse causality (since economic conditions may affect culture as well as vice versa). See, for example, Tabellini 2010, or Guiso, Sapienza, et al. 2006. The latter emphasize the need to show first that culture has a direct impact on expectations or preferences, which has typically been done through surveys or experimental games, and then to illustrate further that those expectations or preferences actually affect economic outcomes such as growth or stagnation. To accomplish the second task, they call for innovative research approaches that allow the causal effects of expectations and preferences, deriving from culture, to be distinguished from other factors. For less technical, but equally valuable, contributions to this literature, see Harrison 1992 or Huntington and Harrison 2000.



this literature explores the relationship between education as a mechanism of socialization and the civic underpinnings of a vibrant entrepreneurial culture. In addition to influencing aspirations, education is also associated with the growth of civic attitudes in young people that support economic development (Putnam 2000). These include interpersonal trust, social capital, and civic knowledge concerning how state institutions reward individual effort and provide ways to mitigate risk and uncertainty (Saxenian 1994; Knack and Keefer 1997; Zak and Knack 2001; Greif 2006). For example, higher levels of interpersonal trust create the confidence required for experimentation and risk-taking within an entrepreneurial culture (Zak and Knack 2001). Dense social networks provide an important infrastructure for sharing information and know-how about opportunities for innovation and entrepreneurship (Saxenian 1994). In a global context, theory suggests that transnational networks with access to “weak ties” will be especially useful to young people in identifying market opportunities (Granovetter 1973).

To illustrate the value of this literature for policymakers as well as scholars, an especially relevant contribution investigated the question of why Silicon Valley grew into the phenomenally innovative hotspot it is today. Using a comparative case study methodology, Saxenian (1994) examined both Silicon Valley and a comparable region on the east coast of the United States, where high-tech innovation initially seemed as likely, if not more likely, to thrive than it did in the Silicon Valley area. The study finds that social networks linking students, employers, and venture capitalists played a significant role in nurturing development in the Silicon Valley case, contributing to the divergence we see today in development across the two regions. Not only did these networks facilitate informal information sharing, but they also created a safety net that encouraged creative thinking and individual initiative, while providing community-wide tolerance for potential failure. Since many new ideas do not turn out to be feasible, social acceptance of the possibility of failure, and a flexible status hierarchy allowing young people to move ahead in the development of other ideas without fear, can be very valuable. Thus, the ideas that translated into Silicon Valley's blockbuster industries and high-tech economic breakthroughs, such as Amazon, Facebook, and Netflix, did not arise and succeed in fostering economic development by chance; they were developed and nurtured in a very supportive social environment that policymakers may seek to replicate.

Finally, education is widely recognized as an important mechanism for the salience of national identity, the transmission of culture, and the preservation of a distinctive heritage (Durkheim 1961; Anderson 1983; Gellner 1983). As a central agent of socialization, along with the family, education affects the degree to which individuals feel a connection with the broader national community and wish to contribute to it. Because knowledge-intensive economic development for *national* growth requires citizens who are committed to the development of their own countries, these variables are also quite relevant for this discussion. One important unintended consequence of strategies to promote knowledge-based economic development is the phenomenon of brain drain, in which the most talented, best educated, and economically active citizens of a country emigrate. Although some argue that such movement can benefit countries of origin through “brain circulation” (Saxenian 2006), brain drain is still seen as a significant problem for developing countries. Indeed, debates about education reform across different countries and historical periods are often sparked by perceptions of tension between the imperatives of development and the need to preserve a sense of national obligation and belonging (Dewey 1938; Tyack and Cuban 1995; Ravitch 2000; Crossley, Broadfoot, et al. 2007; Abi-Mershed 2010; Mazawi and Sultana 2010).

Background on UAE Education⁴

Almost all “regular” public schools in the UAE follow the official Ministry of Education curriculum.⁵ The education system was developed in the seventies with the establishment of the UAE as an independent country in 1971 after the British withdrawal from the Arabian Gulf area. It is free of charge to UAE citizens through the doctoral level.⁶ Since independence, K-12 education has been a federal responsibility, and a very centralized one at that. The Ministry of Education has historically been responsible for all aspects of public education in the UAE, including curriculum development, education policy, and human resources. It is also the Ministry that generally pays teachers’ salaries and holds “hiring and firing” power over staff within regular government schools.⁷

The Applied Technology High Schools (ATHSs) are a new type of public secondary school in the UAE, established in 2005 as a modernizing experiment in the education system in line with international education norms. These schools were initially known as the Institutes of Applied Technology (IATs). Since the nineties, the UAE education system has, like many other education systems, been criticized for reliance on rote learning, insufficient attention to science and technology, lack of emphasis on critical thinking and creativity, limited career counseling, and poor student discipline, among other factors. By not preparing students adequately for competing in the private sector, the education system is believed to perpetuate the UAE citizenry’s over-reliance on state employment. Currently, less than 1% of Emiratis work in the private or semi-private sectors, which are dominated by expatriate residents who are often better educated and/or willing to accept lower salaries (Gonzalez, Karoly, et al. 2008). Many other governing elites also feel, more generally, that the education system does not adequately teach Emirati students about their national heritage, the importance of civic values, and the “soft skills,” “life skills,” or general attitudes needed to succeed today, such as initiative, personal responsibility, and self-confidence. Higher education authorities are especially critical of the K-12 system, since about a third of their federal budget for higher education must be spent on remedial classes for UAE high school graduates unable to enter the public universities directly.

As a top education official has argued, UAE youth are “too relaxed and lack a passion for science and engineering.”⁸ They are “in a sleeping mode,” and the new schools are intended to “bring them to life,” “motivate them to work,” get them “excited about knowledge,” and help them “give back to society.” He described the origins of the ATHS initiative in the vision of the Rulers, especially Sheikh Mohammed bin Zayed, who want to build a more diversified knowledge-based economy driven by Emirati, not foreign, human capital. The official sees the ATHS schools as teaching the knowledge and skills as well as “planting the motivation” in students to take on these new roles, rather than assuming traditional career paths in government ministries. To support the latter aim,

⁴ For an excellent and more detailed discussion of recent education reforms in the UAE, see Ridge and Farah (2012)

⁵ Primary schools in Abu Dhabi emirate are gradually shifting to a different curriculum (the “new school” curriculum), and a small set of other experimental public schools at various levels exist in the country.

⁶ However, public higher education is administered and overseen by a separate arm of government, the Ministry of Higher Education and Scientific Research. The Ministry of Education is concerned solely with K-12 education.

⁷ One exception to this rule is Abu Dhabi emirate, where “hiring and firing” power has very recently shifted from the federal Ministry of Education to a parallel entity known as the Abu Dhabi Education Council (ADEC).

⁸ Author interviews



the schools also aim to build character through stricter rules and a new civics curriculum that encourages youth to be “mature, reliable, and focused,” “self-confident,” and proud of the country’s achievements and future prospects. His Highness Sheikh Mohammed bin Zayed is pictured in ATHS brochures describing the school’s overall aim to “create a world-class Career Technical Education system that will produce the scientists, engineers and technicians needed for the UAE to build a knowledge-based economy.”

The ATHS schools are different from regular government secondary schools in several specific ways. First, the language of instruction is English. This mirrors the practice in the UAE’s public universities, where English is also the language of instruction. Another major difference is the curriculum. The ATHS curriculum has a mandate to focus on science and technology in economically relevant, student-centered, and creativity-enhancing ways,⁹ and its curriculum for most subjects has been adapted from an American curriculum; only in Arabic and Islamic Studies is the curriculum used in the ATHS schools the same as that used in the regular government schools, except that both subjects are allotted less time per week in the ATHS schools. Third, a new civic education program is part of the ATHS curriculum, discussed in more detail below. Fourth, the ATHS schools have several extra-curricular requirements that the regular government schools do not have, such as a community service requirement and a mandatory summer internship between Grades 11 and 12. Fifth, ATHS students are paid a stipend for attending the school and an additional amount for good performance in the civics course. Finally, the ATHS schools have stricter rules and regulations compared to the regular government schools. For example, schools are open more days of the year, workloads are heavier, all students wear uniforms, girls are not allowed to wear any make-up, and boys are required to have a certain military-style haircut. An air of greater discipline, uniformity, and order can generally be found in the ATHS schools.

The new civic education program, called the “Student Citizenship Program,” is offered by a semi-private company closely connected to the Abu Dhabi ruling family, the al Nahyan of the Bani Yas tribal confederation.¹⁰ It is mostly taught by native English speaking expatriates, especially British, and the curriculum is designed by stakeholders in the UAE military, police, and education ministries. His Highness Sheikh Mohammed Bin Zayed is said to play a very significant role in establishing curriculum learning outcomes. The curriculum includes lessons in military and police skills, such as drills, weapons handling, and discipline, as well as life skills and civic virtues, such as responsibility, self-reliance, tolerance, and problem-solving.

There are currently seven ATHS schools in the country, five boys’ schools and two girls’ schools, as K-12 public education is gender-segregated by law. The five boys’ schools were the first to be established, while the two girls’ schools have been added more recently, with more on the way for both genders according to education officials. Four ATHS schools are located in Abu Dhabi emirate, by far the largest and most populous of the seven emirates making up the UAE, and another three are located in Dubai, Ras al Khaimah (RAK), and Fujairah respectively. In the country as a whole, there are about 723 regular government public schools, including primary, middle,

⁹ Some might describe these schools as “vocational,” but those involved shy away from the term because vocational education, like in many other places, is viewed as low status in the UAE. Moreover, the schools have a strong civic education component. Recent reports also suggest the curriculum is shifting to an academic rather than a vocational emphasis.

¹⁰ The program is now called “Al Bayarik.”

secondary, and combinations of the three, in which about 218,000 Emirati youth currently study.¹¹ Studying now at the seven ATHS campuses, which are all secondary schools, are about 3,000 Emirati teenagers between the ages of 15 and 18.

The ATHS school reform was selected for this case study for several reasons. First, it is widely seen as successful, not just in government circles where it is viewed as a promising experiment worth expanding for the benefit of building a knowledge-based economy, but among parents who feel these schools are better than regular government schools; there is therefore good practical motivation to identify the effects of the reform. Second, the school is quite different from regular government schools, and thus represents real change when it comes to building citizens for the knowledge economy. Other reforms have been more narrowly targeted or less ambitious, sometimes existing at the level of reform rhetoric but not extending down into the classroom, making causal effects difficult to uncover because the “treatment” is so uneven or chimerical.

In addition, many of the features of the ATHS school initiative that differentiate it from regular government schools are features that governing elites wish to implement in all regular government schools in a stepwise fashion. For example, plans are underway for public schools to transition to English as the primary language of instruction, as in Singapore, for math and science. Many primary schools have already switched to English for these subjects (e.g. the “new school” curriculum in Abu Dhabi). Finally, the citizenship program used in the ATHS schools is expected to be implemented in regular government schools as well, while at the same time the Ministry of Education is revamping its own civics curriculum to emphasize similar attitudes and values. Indeed, in several ways, the ATHS school reform reflects broader recommendations for Arab education reform, such as those in the Arab Human Development Reports (UNDP 2003) which call for greater emphasis on science and technology, labor market skills, and other changes needed to build a region-wide knowledge economy. Thus, an examination of these schools as a type of reform may provide insights into how similar changes will affect Arab student populations more broadly.

¹¹ Public schools represent about 61% of all 1,190 K-12 schools in the UAE, and cater almost exclusively to UAE citizens. The other 39% are private schools that cater to various nationalities, including Indian, Pakistani, Iranian, and British schools, who make up the majority of the resident population and often follow their own national curricula. In addition, some 84,000 Emirati youth study in private schools, mostly in Dubai (Ministry of Education Strategy 2010-2020). Emirati students in private schools are also required to take Arabic and Islamic Studies in those schools, which must use the UAE Ministry of Education curricula for those subjects, and, soon, a civics course according to sources in the Ministry. Although enforcement practices vary, Arab expat children too are required to take Arabic in private schools, while Muslim children of any nationality are required to take Islamic Studies.



Research Methodology

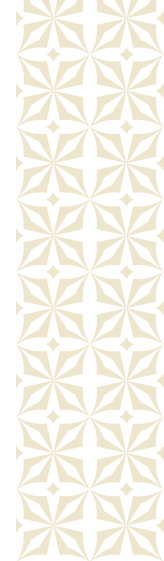
To explore the evolution of attitudes relevant to knowledge-intensive economic development, a quasi-experimental methodology was used to select “control” and “treatment” groups of students for comparison. In this study, the AHS schools served as the “treatment” schools because of the central role they are playing in the broader education reform movement to foster a knowledge-based, post-petroleum economy, as discussed above. Accordingly, in the discussion below, AHS schools are designated as “treatment” schools and regular government schools are designated as “control” schools. Likewise, students in the “treatment” group, or “treated” students, are AHS students, while students in the “control” group, or “control” students, are students at regular government schools.

To estimate causal effects, the study uses a difference-in-differences (DD) strategy in which changes in students’ attitudes across younger and older cohorts within control schools are compared to the changes in those same attitudes across the same “pre” and “post” cohorts in treatment schools. This approach has several advantages for the difficult task of identifying the causal effects of any reform, program, or policy initiative. First, it controls for selection bias in treatment assignment. Selection bias is a well-known challenge to causal inference in studies of school effects, since students are not randomly assigned to schools.¹² The DD approach removes this type of selection bias by subtracting out initial differences in outcomes between control and treatment populations, preventing any unobserved factors that remain constant over time, which correlate with treatment assignment and affect the outcome variables, from biasing treatment effect estimates. Such factors may include income levels, levels of parental education, and other demographic differences. Another advantage of the DD methodology is the removal of bias stemming from aggregate factors that would cause change in the outcome variables over time or across grade cohorts even in the absence of the treatment. Such factors include age or maturation, broad socio-economic changes, and national or regional political context.

The treatment group included all seven AHS schools that currently exist in the UAE, and the control group contained a range of regular government schools following the Ministry of Education curriculum. Within each school, the goal was to select appropriate “pre” and “post” samples of students. In most cases, the younger cohorts (“pre”) were Grade 9 and/or 10 and the older cohort was Grade 11 and/or Grade 12. Thus, the aim was to capture baseline and endline attitudes of students in both types of schools to support a DD causal identification strategy in which initial differences in outcomes are subtracted out of treatment effect estimates. Within schools, available samples of students in younger and older grade cohorts were surveyed. In many schools, all classes within the selected grade cohorts were surveyed during the same school period, enabling census data, while in the remainder of schools, a selection of classes (but not all classes) within the grade cohorts was surveyed.

In the sections that follow, the main effects of the reform are examined by comparing students’ attitudes in control and treatment schools across the entire sample ($n = 4,714$). Statistically

¹² There is, for example, a large literature exploring how attending charter, Catholic, or private schools affects learning outcomes, relative to regular public schools, which grapples with this problem (e.g. Dee and Fu 2003).



significant differences are highlighted and discussed as a foundation for further analysis, while recognizing that true causal effects are always difficult to uncover because of the counterfactual problem. To explore causal effects, the difference-in-differences (DD) approach is used to generate treatment effect estimates across a subsample of the data, in which symmetry is maximized without sacrificing statistical power. In the narrower subsample ($n = 2,489$), only males are included and the “pre” group is limited to students in Grades 9 or 10 and the “post” group is limited to students in Grade 12.¹³ Where DD treatment effects are significant, they are also highlighted and discussed. As a caveat, the key identifying assumption for difference-in-differences (DD) estimation is the assumption of common trends or parallelism, since the control group is used to infer the counterfactual change in outcomes, on average, for the treatment group in the absence of the treatment. In other words, it must be assumed that the average change in outcomes would be the same for both control and treated students, had the treated students not been treated, while recognizing that these populations may be inherently different. In the appendix, evidence is presented that supports this assumption.

DD treatment effects are estimated using OLS regression according to the following basic model, in which Y_i is the outcome for individual i ; “treatment” is a dummy taking the value of 1 if individual i is in the treatment group and 0 otherwise; “post” is a dummy variable taking the value of 1 if individual i is in the “post” group (older grade cohort) and 0 otherwise; and “treatment*post” is the interaction of the two, taking a value of 1 when individual i is in both the treatment and “post” groups.

$$Y_i = B_0 + B_1(\text{treatment}) + B_2(\text{post}) + B_3(\text{treatment*post}) + e_i$$

A regression of this form is a convenient way of generating a DD treatment effect estimate, which is represented by the estimated coefficient on the interaction term, B_3 . In practice, this estimate is equivalent to that produced by subtracting the difference in means between treatment and control in the “pre” group from the difference in means between treatment and control in the “post” group. Using regression to generate DD treatment effects also provides the benefit of adding controls to the model in a stepwise fashion and adjusting the ways in which standard errors are estimated.

¹³ This subsample approach recognizes that each set of comparison groups, within the entire sample, has strengths and weaknesses in terms of estimating treatment effects, particularly in balancing symmetry across school type and “pre” and “post” with statistical power in the number of observations and school clusters. Future analysis will relax the DD identifying assumption in order to examine the entire sample, including female students.



Survey Design and Measurement

A survey was developed in Arabic to measure the main dependent variables in this study exploring the evolution of attitudes relevant to knowledge-intensive economic development. The survey was designed on the basis of a review of existing survey instruments and several months of combined qualitative fieldwork, including interviews with students, teachers, education administrators, business leaders, and governing elites. It was piloted in the fall of 2010 on a sample population of 62 high school students in Ras al Khaimah, the northernmost emirate in the UAE, and subsequently refined before being used on a larger scale in the spring and fall of 2011. The paper survey was typically administered by the researcher or an instructor to groups of 10-20 Emirati students at a time within classrooms or auditoriums. Students were introduced to the survey with an explanation of the purpose of the study to explore the attitudes and opinions of Emirati youth. In accordance with the study's IRB protocol, the introduction also explained that the survey was not required and thus completely voluntary, and guaranteed that no personally identifying information would be released to link survey results to individual participants.

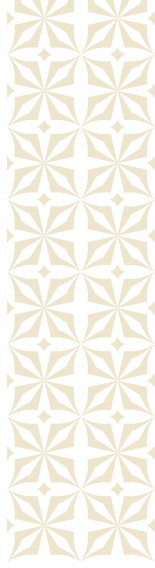
To measure students' levels of achievement motivation, the well-known achievement motivation inventory (AMI) was adapted into an aggregate index of nine Likert items, including subconstructs such as competitiveness, fearlessness, and preference for difficult tasks (Schuler, Thornton, et al. 2004). As a measure of individual difference, achievement motivation is commonly defined as "an individual's tendency to desire and work toward accomplishing challenging personal and professional goals," and evidence supports the AMI's cross-cultural validity (Byrnea, Mueller-Hanson, et al. 2004, 204). Likert items included statements such as "If someone is working on the same thing as I am, I try to be better or faster" and "I have not tried to do some things because I was afraid I would not succeed."

Next, the survey measured nationalism, pride in the UAE, and civic-mindedness. To measure nationalism, Kosterman and Feshbach's aggregate Likert scale (1989) was adapted, including statements such as "I love the UAE." A national pride scale was also adapted from the International Social Survey Program (ISSP), which focused on domain-specific pride, asking respondents whether they feel proud of the UAE in specific substantive areas. To capture civic-mindedness, respondents were given a scenario adapted from civic attitude surveys, in which they were told to imagine that littering had made a major landmark very unattractive, with some people saying UAE citizens have a civic obligation to help clean it up. They were then asked how much time, if any, they would be willing to volunteer to help with the clean-up during a two-week break, ranging from (1) None, the government should handle it to (14) The whole break.

The survey also measured social capital, willingness to take risks, and willingness to invest in a promising business idea, all of which are attitudes associated in the literature with innovation-driven economic development. To measure social capital, a variation on the social capital item on the World Values Surveys was used. Respondents were asked to place their opinion on a seven-item scale ranging from (1) You can't trust most people in the UAE to (7) You can trust most people in the UAE. Willingness to take risks was measured with the question, "How willing or unwilling are you to take risks, if there is a good chance of reward?" adapted from Rohrmann (2005). The answer

scale consisted of a seven-item scale ranging from (1) I'm not willing to take risks to (7) I'm willing to take risks. Drawing from research suggesting that risk-taking propensity in specific substantive areas may be more informative than a self-assessment (Weber, Blais, et al. 2002), willingness to invest in a promising business idea was measured with the scenario, "Suppose you have 100,000 dirhams saved, and a friend asks you to invest in a promising new company that has a good chance to make quite a lot of money for you, but it could also fail so you could lose everything you invested. How much do you think you would invest?" The answer scale consisted of (1) None of it to (21) All of it.

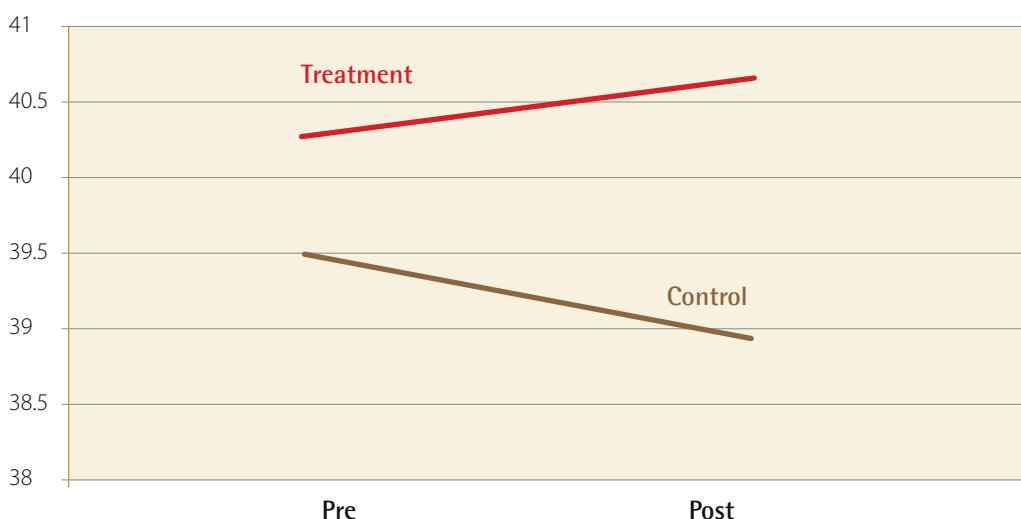
Finally, the survey measured students' job priorities and values. Respondents were asked, thinking about the future, how important they consider various factors in selecting a job, including "money/salary," "opportunities to solve problems," "contributing to the UAE," and "respect." They were also asked to rate how much they value different items, using the question, "People value different things when raising children. What do you think is most important to encourage in children today?" Items included "obedience," "feeling of responsibility," "hard work," and "tolerance." Both questions were drawn from similar questions on the World Values Surveys.



Results and Discussions

The sample (n = 4,714) included students from all seven AHS or “treatment” schools (n = 2,449) and thirteen regular government or “control” schools (n = 2,265). Among the treatment schools, four were in Abu Dhabi and Al Ain, and one each was in Dubai, Ras al Khaimah, and Fujairah. All were boys’ schools, except for the two girls’ schools in Abu Dhabi. Among the control schools, six were in Dubai and Hatta (three girls’ and three boys’ schools), and the rest were in Ras al Khaimah (four boys’ and three girls’ schools). Dubai, Ras al Khaimah, and the northern emirates offer excellent schools for a control group because they follow the same federal Ministry of Education curriculum; regular government secondary schools in Abu Dhabi, by contrast, are shifting to a different curriculum.

Figure 1: Achievement Motivation



Note: Achievement motivation was measured with an aggregate index of nine likert items; more information can be found in the appendix.

Not surprisingly, as shown in the appendix, students in the treatment group reported higher incomes and parental education relative to students in the control group, which confirms the expectations of UAE educational practitioners and researchers. As with other types of school reform, students with better educated parents are more inclined to participate in innovative educational initiatives. This is a common type of self-selection, as explained above, that subsequent analysis will address through a difference-in-differences (DD) approach, which subtracts out initial differences in attitudes that may result from such factors in the estimation of causal effects. More information about descriptive statistics across treatment and control can be found in the appendix, including for gender, income, parental education, and other demographic variables of interest. DD treatment effect estimates, discussed below, control for income and parental education, and cluster standard errors by school.

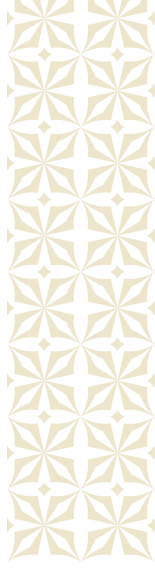
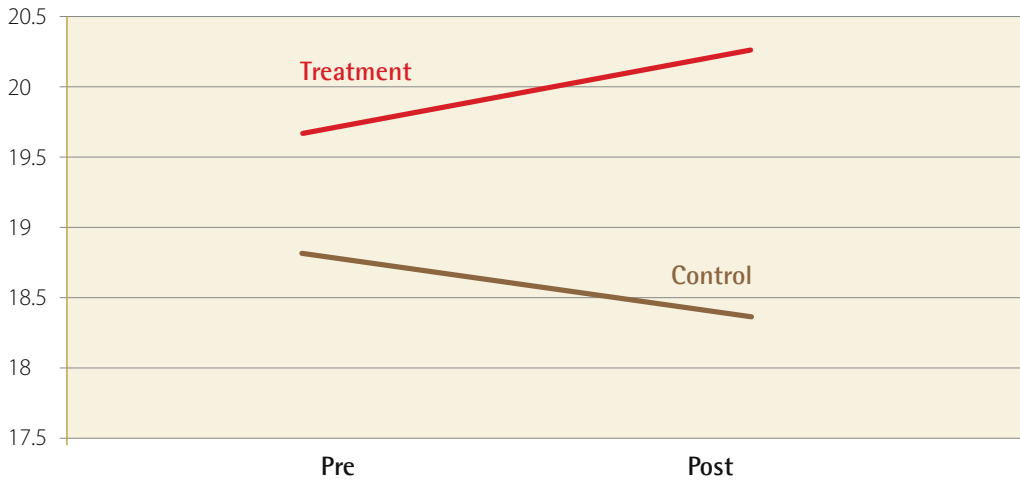


Figure 2: Nationalism



Note: Nationalism was measured with a five-item aggregate index; for more information, see the appendix

How did students' attitudes in the treatment schools compare with students' attitudes in the regular government schools? The data provide substantial evidence that students' attitudes in the treatment schools are more aligned with knowledge-intensive economic development than are students' attitudes in regular government schools. First, as shown in Figure 1, treated students displayed significantly higher levels of achievement motivation than did their counterparts in regular government schools ($p = 0.000$). Younger students in the treatment group ("Pre") displayed higher levels of achievement motivation than did younger students in the control group, suggesting that highly motivated students are drawn to the treatment schools. This initial gap in achievement motivation between the two groups widened for older students ("Post"), with an upward trend for treated students and a downward trend for control students. Although the difference-in-differences (DD) estimate of the causal effect of treatment schools on achievement motivation is not significant, the consistently higher levels for students in treatment schools indicate that treatment schools are attracting highly motivated UAE youth and maintaining their greater motivational drive. On the other hand, the downward slope of achievement motivation in the regular government schools points to a need for greater encouragement of this attitude in the broader educational system.

Treated students also showed significantly higher levels of nationalism ($p = 0.000$) and pride in the UAE ($p = 0.000$) compared to students in the regular government schools. As discussed above, an important element in building a knowledge economy, which is often overlooked, is ensuring citizens' commitment to their home countries, so that their efforts will support national economic development. Brain drain is a well-known problem, intensified by globalization, which can occur as an unintended consequence of education reform and other efforts to prepare citizens to engage in knowledge-intensive economic development. Interestingly, difference-in-difference (DD) estimates of the effect of the treatment school on students' attitudes in these areas are positive and statistically significant (nationalism, $p = 0.005$; pride in the UAE, $p = 0.004$). Thus, treated students not only showed greater national pride and commitment in the sample than control students, but the evidence also suggests that the treatment schools may be promoting these attitudes. Again, however, while treated students revealed an upward trend, control students showed a downward trend, a difference that may require further analysis and policy attention.

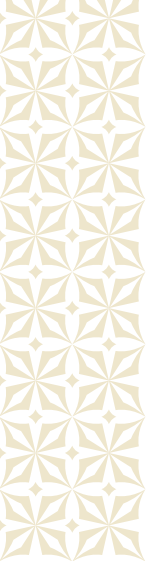
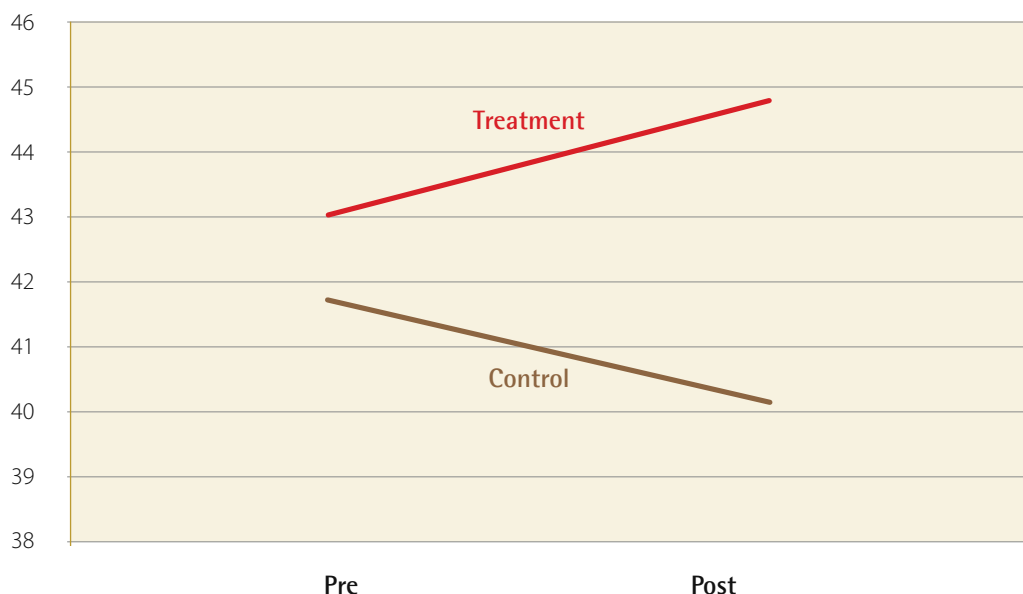


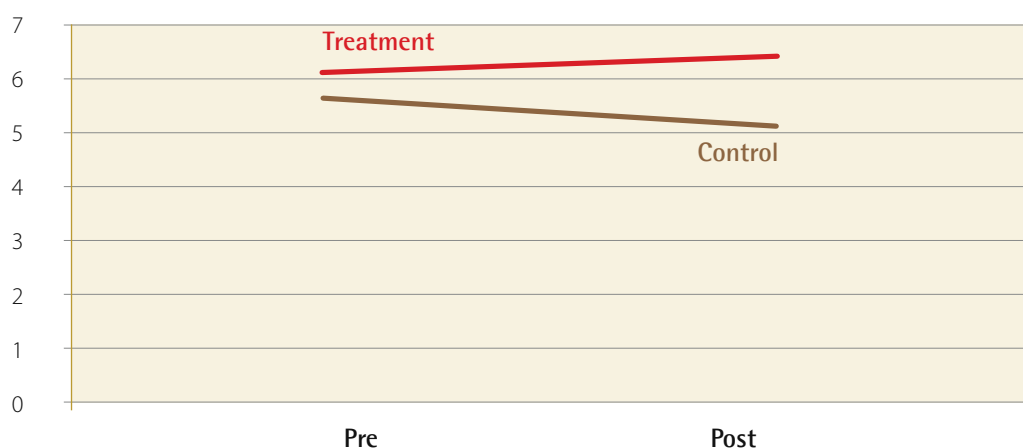
Figure 3: Pride in the UAE



Note: Pride in the UAE was measured with a seven-item aggregate index; for more information, see the appendix.

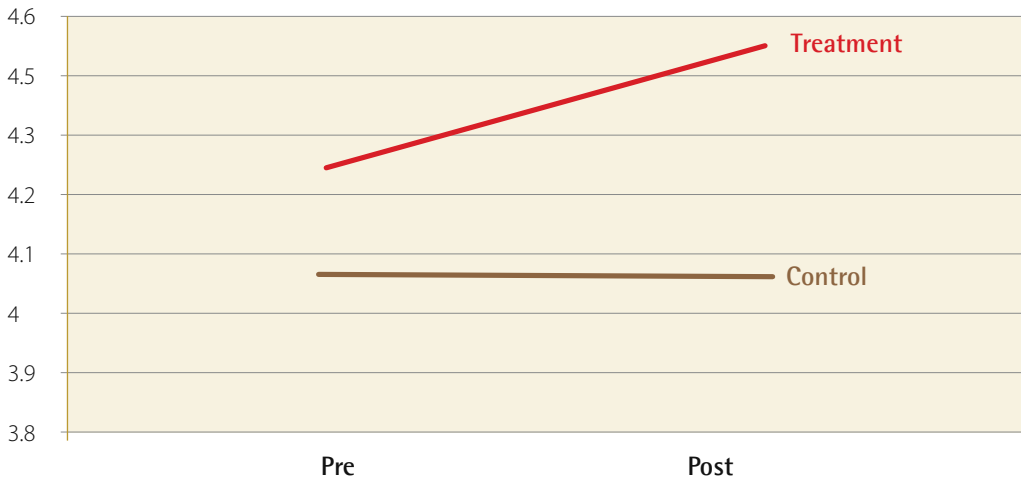
A similar result emerges for civic-mindedness. Treated students were willing to spend more time over a two-week break helping to clean up litter around a national monument. On average, control students were willing to spend four and a half hours over a two-week break, while treated students were willing to spend over six hours. Although the difference is small, it is significant ($p = 0.000$). The difference-in-differences (DD) estimate for the effect of the treatment school on civic-mindedness, however, is not significant. Thus, it may be that treatment schools are environments in which treated students' higher levels of civic-mindedness are nurtured and thus able to persist in ways that are not apparent in the regular government schools. A key contributing factor may be the emphasis in the treatment schools on fostering a culture of volunteering and community service through new requirements.

Figure 4: Civic-mindedness



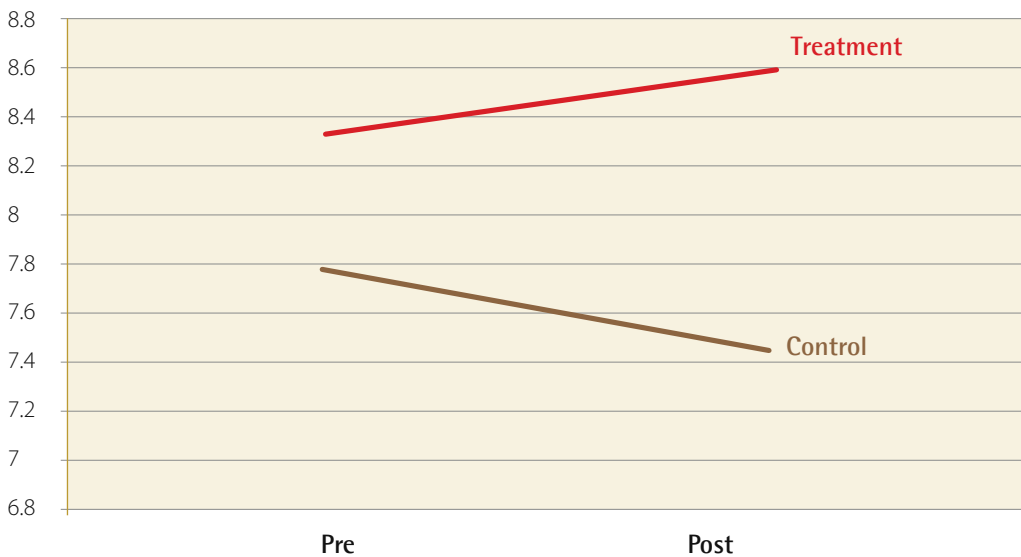
Note: The scenario given was, "littering has made a major national landmark very unattractive, some people think that UAE citizens have a civic obligation to help clean it up. How much time would you be willing to volunteer to help the clean-up effort over a two-week break?" The answer scale went from (1) None, the government should handle it, (2) 1 hour, (3) 2 hours, (4) 3 hours, (5) 4 hours, (6) 5 hours, (7) 6 hours, (8) 7 hours, (9) 1 day, (11) 2-3 days, (12) 4-5 days, (13) A week, (14) All 2 weeks

Figure 5: Willingness to Take Risks



Note: Willingness to take risks was measured with a self-assessment question, “In general, are you willing or unwilling to take risks, if there is a good chance of reward?” The answer scale ranged from (1) I’m not willing to take risks to (7) I’m willing to take risks.

Figure 6: Willingness to Invest



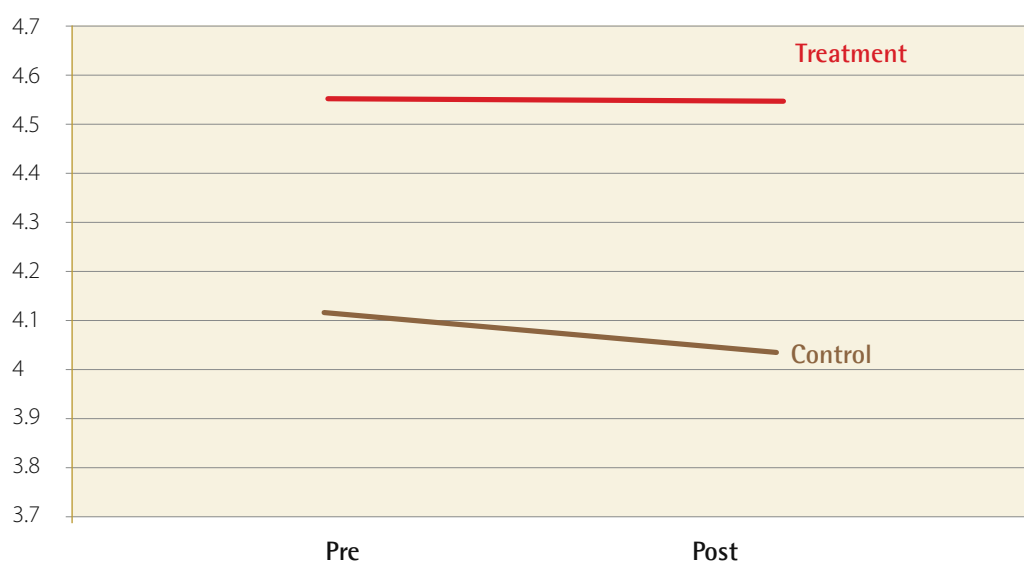
Note: Willingness to invest was measured with the following scenario: “Suppose you have 100,000 dirhams saved, and a friend asked you to invest in a promising new company that has a good chance to make quite a lot of money for you, but it could also fail so you could lose everything you invested. How much do you think you would invest?” The answer scale ranged from (1) None of it to (21) All of it

As shown in Figures 5 and 6, the data also provide substantial evidence that treated students are more willing to take risks ($p = 0.000$) and invest in a promising business idea ($p = 0.000$), compared with students in regular government schools. Figure 5 shows that younger students in the treatment group reported greater willingness to take risks, compared with younger students in the control group. Across the grade cohorts, moreover, risk-taking propensity remained constant for students in the control group, but increased significantly for treated students. Although the main effect for the treatment schools is significant, the difference-in-difference (DD) estimate,

which controls for selection and other factors, is not significant. As with achievement motivation, this suggests that treatment schools are attracting students with a higher willingness to take risks, and providing an environment in which that attitude can persist and develop in potentially important ways for the development of an innovative and economically motivated citizenry.

The difference-in-differences (DD) estimate for the effect of the treatment schools on willingness to invest in a promising business idea is also significant ($p = 0.036$). Thus, the data suggest not only that treated students are more willing to invest in a promising business idea, but also that the treatment schools are augmenting their positive attitudes toward investment. On average, treated students were willing to invest about 36,000 dirham out of 100,000 dirham in a promising business idea, as shown in Figure 6, while control students were only willing to invest 33,000 dirham. The difference-in-differences (DD) estimate of the effect of the treatment school on this attitude was approximately one point on the twenty-one point answer scale, suggesting a treatment effect of about 5,000 dirhams after subtracting out differences stemming from income and other factors across the treatment and control groups. (This amount is different from the difference in the two averages noted above because the difference-in-differences analysis was performed on a narrower subsample of the data to maximize balance and statistical power.) Since willingness to take risks and invest in new business ideas is closely associated in theory with knowledge-intensive economic development, these results are very promising.

Figure 7: Social Capital



Note: Social capital was measured using a variation on the standard item in the World Values Survey, in which higher scores indicate higher social capital. The answer scale ranged from (1) You can't trust most people in the UAE to (7) You can trust most people in the UAE.

On the other hand, a more qualified picture emerges from the results for social capital. As shown in Figure 7, treated students revealed attitudes significantly closer to the high end of the social capital scale ("You can trust most people in the UAE"). Although both treated and control students' means on this scale hover near the center, as is typical with odd-numbered scales that offer a neutral mid-point, the difference between the two groups is significant and provocative. Younger

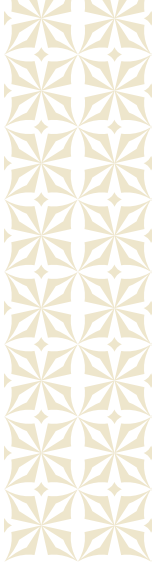
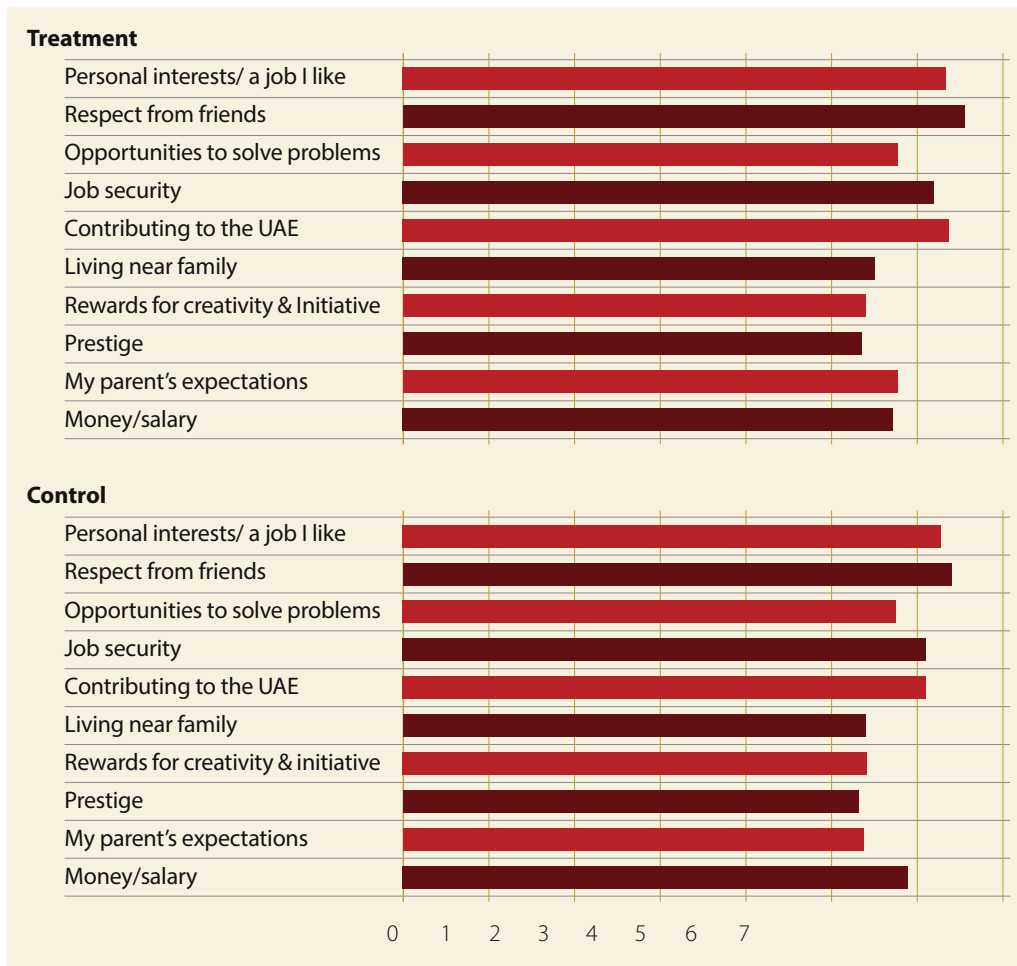


Figure 8: Job Priorities



Note: Importance of various factors in choosing a job was measured by asking the question: “How important are the following items to you in a job?” The answer scale went from (1) Not important at all to (7) Very important

students in the treatment group revealed greater trust than their counterparts in the control group, and the difference remained roughly the same across the grade cohorts. Not surprisingly, the difference-in-differences (DD) estimate of the effect of the treatment schools on social capital is not significant. Since trust and social capital are among the attitudes that theorists of culture and economic development consider most important, these results may call for further research into why these attitudes differ across the two groups. One possible explanation is that students with higher achievement motivation and risk-taking propensity are implicitly more trusting. In other words, because they expect to succeed, they do not expect to be cheated or otherwise thwarted in achieving their goals. Another possibility is that elite students with higher incomes and parental education possess higher social capital because of familial or other connections with administrative and governing authorities, as suggested to some extent by other scholars who study the nature of social capital in the Middle East, such as Amaney Jamal.

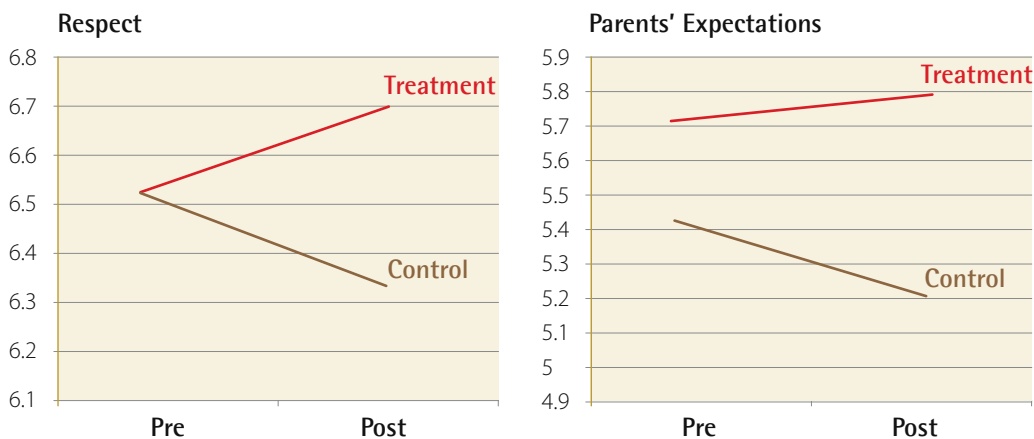
Some intriguing differences were also found in students’ job priorities. On average, both groups found “respect” and “personal interest/a job I like” to be the most important factors in selecting a future job. In keeping with their higher nationalism and pride in country, treated students saw

“contributing to UAE society” ($p = 0.000$) as significantly more important in selecting a job than did control students. Control students also valued “money/salary” significantly more than treated students ($p = 0.000$). These results again suggest a strong selection effect in which students with higher motivation, willingness to take risks, social capital, and national commitment are attending the treatment schools.

Even when controlling for that selection effect, the evidence suggests that the treatment schools are affecting students’ job priorities in intriguing ways. As shown in Figure 9, difference-in-difference (DD) estimates of the causal effect of the treatment schools are significant and positive for both “respect from friends” ($p = 0.059$) and “parents’ expectations” ($p = 0.018$). One explanation may be anxiety about grades and ranking at the treatment schools, where the American-adapted curriculum is more fast-paced and demanding. Another may be a heightened sensitivity to status and social approval. On the one hand, these attitudes can support knowledge-intensive economic development, if friends and family value engagement in these areas. On the other hand, if they do not, or if they do, but students worry so much about disappointing them that they do not try anything new, then these attitudes may not facilitate knowledge-intensive economic development. Such attitudes in the latter case are more likely to preserve and promote traditional career paths where the road to success is clear and well-traveled. As Saxenian (1994) argues, California’s Silicon Valley benefited from a frontier-like culture with a “live and let live” ethos, in which people could “fail” in one or more business ventures and yet still maintain respect and status in the local community. Since many new ideas do not become profitable, community-wide tolerance for possible failure is an important social bedrock for innovation.

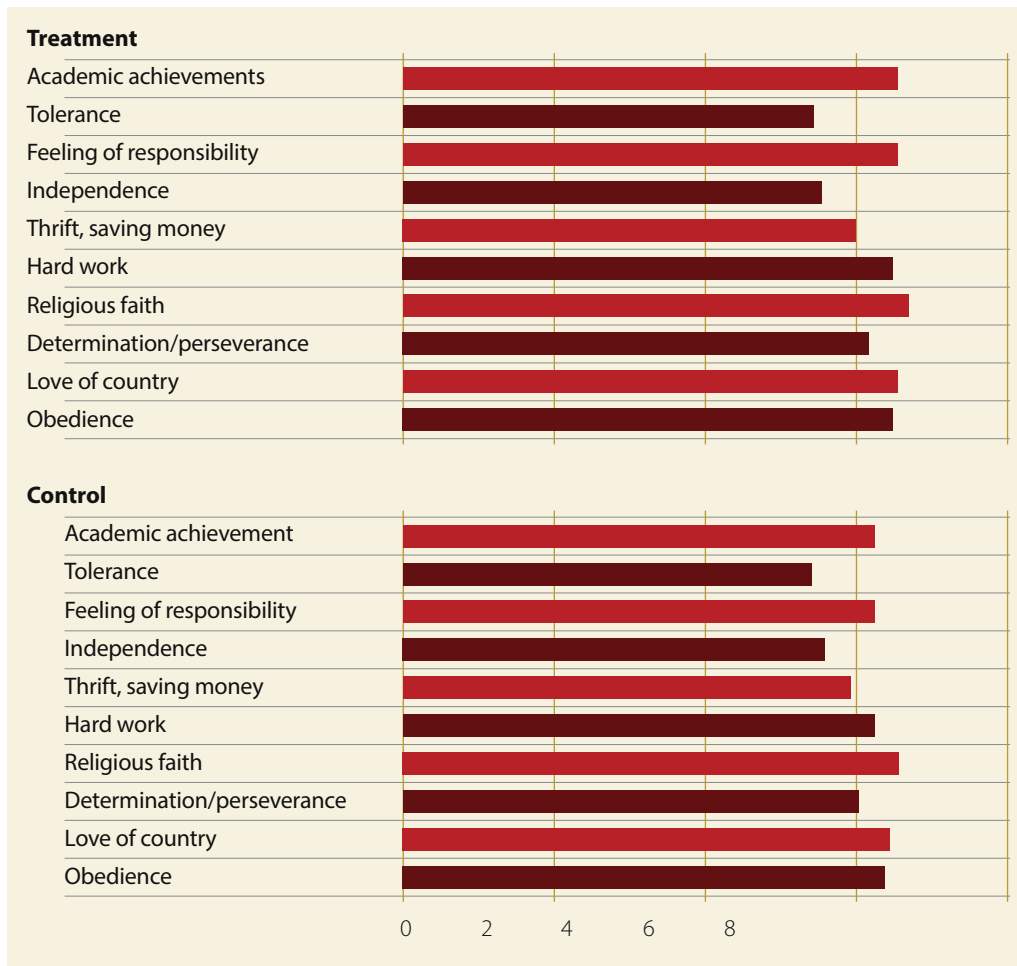
Valuable findings also emerged from an analysis of students’ values. As shown in Figure 10, the distribution in values is roughly similar across the control and treatment groups, with “religious faith” as the factor students think is most important to encourage when raising children today. From the list provided, “independence” and “tolerance” are seen as the least important, though the means for these variables are still on the right-hand side of the scale’s neutral mid-point.

Figure 9: Importance of Respect and Parents’ Expectations



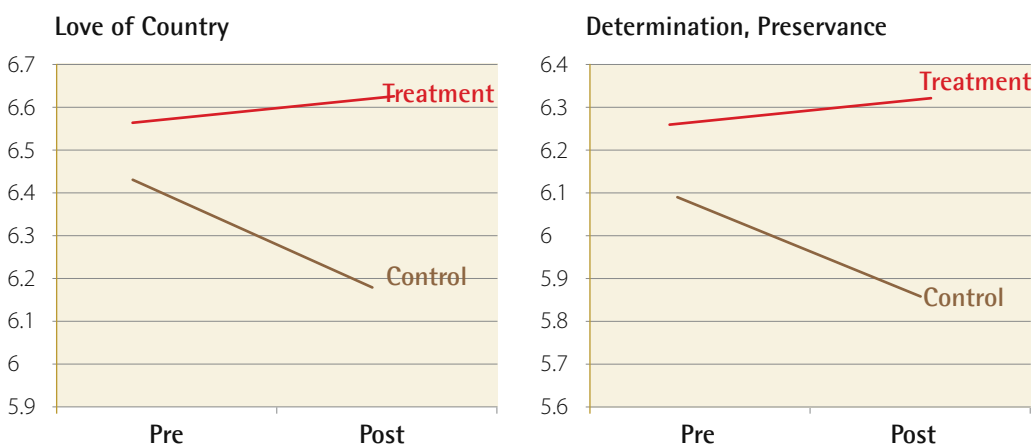
Note: Importance of various factors in choosing a job was measured by asking the question: “How important are the following items to you in a job?” The answer scale went from (1) Not important at all to (7) Very important

Figure 10: Values

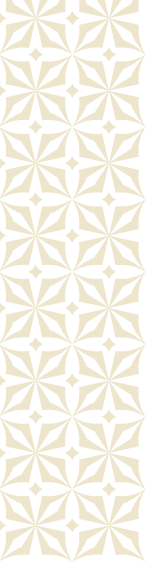


Note: Values were measured by asking the question, "People value different things when raising children. What do you think is most important to encourage in children today?" The answer scale ranged from (1) Not very important to (7) Very important.

Figure 11: Love of Country and Determination



Note: Values were measured by asking the question, "People value different things when raising children. What do you think is most important to encourage in children today?" The answer scale ranged from (1) Not very important to (7) Very important.



Difference-in-difference (DD) analysis of the effect of the treatment schools on values revealed significant effect estimates for “love of country,” “determination, perseverance,” “independence,” “tolerance,” and “academic achievement.” The changes for “love of country” and determination, perseverance” are shown in Figure 11, where the graph reveals an intriguing divergence in attitude change within treatment and control schools. Whereas older students in regular government schools value these items less than younger students, the trend is just the opposite in treatment schools, where older students value these items more than younger students.

The evidence, therefore, suggests that the treatment schools are boosting the value students place on love of country and determination, or perseverance. These are promising results pointing to the potential impact of the civics program developed by Al Shaheen, which works in the treatment schools to build character and foster good citizenship. An important question for future research is to identify what elements of this civics program are responsible for these changes. Since the program aims to promote several other values that were listed on the survey, such as responsibility and tolerance, it is not yet clear why love of country and determination were influenced more than the others.

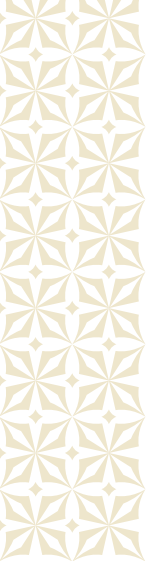
Conclusions and Policy Implications

This working paper has presented results of an intensive case study of education reform to promote knowledge-based economic development, carried out in the United Arab Emirates (UAE). Its main purpose has been to help inform research and policy development in these areas with systematic data and a rigorous research methodology. Although further analysis of additional variables is needed, the present findings suggest a number of possibilities for further research and policy refinement.

First, the results suggest that the treatment schools are attracting highly motivated UAE youth with higher social capital and greater willingness to take risks if there is a good chance of reward. The analysis of causal effects indicates that the treatment schools may also be increasing students' willingness to invest in a promising business idea. These are important attitudes connected in the literature with knowledge-intensive economic growth, especially social environments that facilitate the growth and consolidation of innovation hotspots (Saxenian 1994). Investing in a new idea, by its very nature, takes a certain willingness to take risks, which in turn is an attitude that emerges and persists more successfully in places with high social capital where people trust one another to uphold agreements. Why take a risk by starting a business or investing in a new business idea, if you don't consider others in the community to be trustworthy? Given these results, policymakers and education practitioners involved with the treatment schools, and other similar initiatives, might consider new strategies to help these kinds of students apply their higher social capital, achievement motivation, and willingness to take risks in productive ways.

One approach may be to develop more diverse, individually tailored opportunities for these motivated young people to meet and build relationships with potential kindred spirits, such as innovators, scientists, business owners, investors, and other key players in the global knowledge economy. In the UAE, the recognition that career counseling is limited in secondary schools has led to a flurry of job fairs, entrepreneurship training initiatives, and other well-publicized networking events. Although these are familiar strategies, some qualitative evidence from the case study suggests that students in the treatment schools, in particular, are feeling overwhelmed by them. Such "event fatigue" might be avoided by developing fewer, but potentially more high-impact, initiatives that are tailored to students' own interests, passions, and strengths. For example, the evidence from this research indicates a higher willingness of students in the treatment group to take risks and invest in a promising business idea. Thus, initiatives that allow these students to meet with investors in their area of interest, hear about how investment works, and learn how to evaluate new business ideas effectively may be especially valuable. Given that these students also report higher family incomes, such efforts may help channel some of their wealth into productive investments for the country. To spur knowledge-intensive economic development, then, it may be that *investing* in innovation, rather than innovating *per se*, is a more useful activity to encourage in young people within resource-rich countries with relatively high incomes per capita, such as the UAE.

In addition to more targeted initiatives teaching UAE youth how to become smart investors, with a focus on innovation in their own country, policymakers might consider strategies that expose



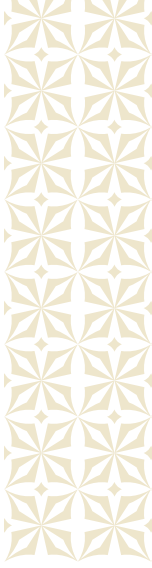
students to a broader range of possibilities for contributing to knowledge-intensive economic development. Although the school reform in this case study stresses science and technology, many innovations involve not just technical skills but insights from a variety of information sources, life experiences, and knowledge bases. A new online service called Memrise, for example, helps users to memorize foreign language vocabularies by leveraging user-generated mnemonic devices, dynamic individualized “memory gardens,” and memory-building techniques such as elaborate encoding, choreographed testing, and scheduled reminders. The idea emerged from collaboration among neuroscience graduate students, computer scientists, graphic designers, foreign language experts, and a “Grandmaster” of competitive memory retention, among others. In UAE secondary schools, however, emphasis is laid understandably on English, math, and science. As a result, students with other interests have few outlets to pursue them. The results of this case study, illustrating the high value placed on religion, parents’ expectations, and respect, suggest that UAE students may find technology innovations related to religious engagement, family interaction, and status signaling to be especially appealing.

At the same time, these results highlight a divergence in students’ attitudes across the two types of schools, which may call for more research and policy attention. The case study suggests that students in regular government schools have lower achievement motivation, social capital, willingness to take risks, and willingness to invest. In the sample, civic-mindedness, nationalism, and pride in country were also lower relative to students in the treatment group. Although some of these differences may stem from income inequality, it would be valuable for future research to investigate the reasons for the divergence more fully, so that policymakers can tailor strategies to address it. As with any reform, the possibility arises that those who are not included in the reform may be left behind, particularly if the reform is effective. One potentially unintended consequence, then, of education reform for the knowledge economy may be increased stratification and social strain. Greater class rigidity and economic stratification, in turn, are not likely to facilitate knowledge-intensive economic development because of the nature of innovation itself. As Christensen (1997) argues in *The Innovator’s Dilemma*, it can be difficult to predict where innovations will emerge, who will develop them, and which ones will become profitable. As a result, a wise overarching strategy for policymakers seeking to build citizens for the knowledge economy may be to open as many doors to potential innovation and economic engagement as possible.

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