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Objective

This study examined the effect of cultural values on explaining differences in student performance on international tests such as PISA and TIMSS. There has been ongoing interest in understanding the observed differences between the academic performance of US students and their counterparts in other countries, particularly in mathematics and science. Much of the research in this area has focused on comparisons of individual factors or educational policy. Prior research on individual factors has focused on variables such as economic and social status (e.g., Marks, 2006; OECD, 2011), gender and gender-roles (Else-Quest, Hyde, & Linn, 2010), intrinsic and extrinsic motivation (e.g., Chen & Stevenson, 1995; Liou, 2010), and differences in test-taking effort (Barry *et al*., 2010). Policy-focused studies have examined topics such as: national standards and curriculum (e.g., Bishop, 1997); standardized high-stakes tests (e.g., Firestone & Mayrowetz, 2000); educational tracking (e.g., Hanushek & Woessman, 2006); and teacher compensation (Carnoy *et al*., 2009). Other studies have argued that variation in student performance within countries can overshadow interpretations of between-country differences (e.g., Huang, 2009).

One area that has not received as much attention is the role of cultural values in student performance. This study explores the role of the cultural variables of individualism and collectivism. Cultural values have pervasive effects on its

members, influencing how people view themselves and their respective society's institutions, including education. Therefore, cultural values are hypothesized to affect educational outcomes at a national level as well as for individual students' performance.

Theoretical Framework

The present study uses the cultural values theoretical framework (Hofstede, 2001), focusing in particular on cultural differences in self-other orientations including individualism and collectivism (Triandis, 2001). Prior research has demonstrated that such cultural values have profound impacts on members of the culture, including one's sense of subjective well-being (Fulmer *et al*., 2010), parents' beliefs and expectations for their children's future (Chen & Uttal, 1988), and one's reasoning about the natural world (Aikenhead & Olugbemiro, 1999; Bang & Medin, 2010).

The present study explored two constructs: individualism and institutional collectivism. Individualism is the extent to which members of society are "autonomous and independent from their in-groups" (Triandis, 2001, p. 909). Institutional collectivism is defined as "the degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action" (House *et al*., 2004, p. 30). Individuals from Western European cultures tend to score higher on individualism, and lower on collectivism than do people from East Asian cultures (*cf*. House *et al*., 2004; Triandis, 2001).

Methods

The study used two-level hierarchical linear models (Raudenbush & Bryk, 2002), with student variables at level one and cultural variables at level two. This

multilevel approach accounts for variation at the student level to provide more reliable standard errors for the estimated parameters. Data analyses were conducted using the MIXED procedure of SPSS 18 following the example of Norusis (2005). An initial model without any predictors (*Model A*) was used to estimate the amount of variation in the model to be explained. A second model was then estimated with student-level predictors (*Model B*). Finally, a model with country-level predictors for the intercept was estimated (*Model C*). Additional country-level predictors for other student-level terms were not estimated because such estimates would not be robust, considering the limited number of countries with complete cultural-level data (N=35). This modeling process was completed for each of three student-level dependent variables: *reading*, *mathematics*, and *science* performance. The next section describes the data sources in detail.

Data Sources

The study uses data from international surveys. First, data on cultural values was drawn from two sets of studies: GLOBE (House *et al*., 2004) and Hofstede Scores (2011). Second, data on student performance was drawn from the 2009 PISA data collection (OECD, 2009). PISA was selected because it contains a larger number of countries and has greater overlap with both the GLOBE and Hofstede datasets than TIMSS. PISA 2009 focused on reading, but also included mathematics and science assessments; these were the three dependent variables selected for the analysis. For each subject area, PISA calculates five plausible values for every student. This reflects the fact that not all students take all items, but that there are intentional overlapping items across all students in all countries. For the present study, a mean

score for each of the three subject areas was calculated for each student from these plausible values.

Two student-level independent variables were included from the PISA 2009 dataset: an index of economic and social status, ESCS (M= -0.286 & SD= 1.14), calculated by OECD; and gender (recoded as 0 for male, 1 for female). Two country-level independent variables were included: individualism (IDV, M= 51.9 & SD= 24.1) indices from Hofstede (2011); and institutional collectivism (ICOL, M= 4.28 & SD= 0.41) from GLOBE.

Results

Three models (A, B, and C) were estimated for each of the dependent variables —reading (Table 1), mathematics (Table 2), and science (Table 3). The specific estimates differ across content areas, though some patterns of effects are quite similar. The inclusion of student-level predictors explained about 20% of the variance in the data for each subject. Across all subjects, there was a significant, positive effect of students' ESCS on performance. This is not surprising; it matches findings of Marks (2006). This supports the inclusion of ESCS as a control variable at the student-level. There were also significant gender effects, which varied by subject area. In reading and science, there were significant, positive effects of gender, indicating that girls performed better on reading and science than did boys. In mathematics, there was a significant, negative effect of gender, indicating that girls performed worse in mathematics than did boys. This finding was also not surprising (*cf*. Else-Quest, Hyde, & Linn, 2010).

At the country level, the inclusion of cultural values as predictors explained approximately 20% of the variance in the data for each of the three subject areas. There was a significant, positive effect of institutional collectivism on students' performance in all subject areas. Thus, after accounting for ESCS and gender at the student level, students in cultures with higher institutional collectivism scored higher than did students in cultures low on collectivism. Across all subjects, there was not a statistically significant effect of country-level individualism. This indicates no relationship between students' performance and individualism in their culture.

Significance of the Study

There has been much research seeking to explain differences in countries' performance on international assessments such as PISA and TIMSS. As summarized above, prior work has tended to focus on important student-level variables or educational policy differences. However, there has been little discussion about whether such differences relate less to policy distinctions across countries than to divergent cultural values. This study addressed that limitation by focusing explicitly on the cultural values of the individualism and institutional collectivism.

This study demonstrated that students in countries with higher institutional collectivism have higher scores, after accounting for individual differences such as economic and social capital and gender differences. Recall that high institutional collectivism indicates that members of the culture identify with their institutions as a shared resource and as an important element in achieving the society's goals. One possible explanation for the present finding is that, in cultures with high institutional collectivism, members of society perceive the education system as having high

legitimacy and serving an essential part in society. By contrast, when institutional collectivism is low, social institutions such as education are important but not as significant for individuals' identity and everyday activity.

Particularly within the US, concern over national performance on PISA and TIMSS has led to debate about how to structure the education system to achieve greater results. The present study suggests that some of the difference in performance may be explained by differences in how members of the culture value the education system. One possible implication is whether it is possible to increase US citizens' identification with their educational system and their support for its role as a shared resource that supports the nation's goals. Additional research on cultural values and their relationship to education is needed to help inform this debate on education policy.

This study did not find a significant effect of individualism on student performance in any subject area. This contrasts with the findings of Chiu *et al*. (2007) who found individualism a significant cultural value in their study of the effect of learning strategies. One explanation for this difference is that the present study also included institutional collectivism, which Chiu and colleagues did not. Prior research has demonstrated that individualism and collectivism are negatively correlated, although they are not currently conceptualized as being opposites on a continuum of self-other (*cf*. Triandis, 2001). Because the two constructs are related but not synonymous (or antonymous), the present study may reveal that institutional collectivism explains part of the variance that individualism may have explained in previous studies.

The present study is limited by the lack of data on cultural values for some countries. The full PISA 2009 dataset includes data from 75 countries: 34 OECD member countries and 41 partner countries and economies (OECD, 2009). However, after merging data from the GLOBE and Hofstede datasets, there were only 35 countries with full data. Although countries from all regions of the planet are included in the final dataset (a full list of included countries will be available in the full paper), the study would be strengthened with data on cultural values for all countries and economies included in PISA. If the results remained consistent with more countries participating, this would add support for the findings. One approach to achieve this goal is for PISA to include cultural values items as part of the student or parent questionnaires. This would also allow the analysis of cultural values as practiced on the individual level in addition to the country level, which may yield interesting and conflicting findings (*cf*. Fulmer *et al*., 2010). Furthermore, such an expanded dataset would enable the analysis of a larger number of interactions among country-level variables or across the individual and country levels than are supported in the current study.

Tables

Table 1. Summary of Model Results for Reading

Source	Model A		Model B		Model C	
Intercept	465.08	**	454.36	**	251.77	**
ESCS			32.02	**	31.22	**
Gender			38.65	**	35.42	**
IDV					0.27	‡
ICOL					50.07	**

Percent Variance Explained	20.1%	40.6%

* p<0.01; ** p<.001; ‡p>.10

Table 2. Summary of Model Results for Mathematics

Source	Model A	Model B	Model C
Intercept	468.33 **	481.66 **	139.65 ‡
ESCS		31.61 **	31.05 **
Gender		-9.65 **	-12.08 **
IDV			0.49 ‡
ICOL			80.27 **
Percent Variance Explained		17.8%	43.5%

* p<0.01; ** p<.001; ‡p>.10

Table 3. Summary of Model Results for Science

Source	Model A	Model B	Model C
Intercept	472.15 **	479.54 **	215.08 *
ESCS		31.26 **	30.79 **
Gender		2.21 **	1.51 **
IDV			0.54 ‡
ICOL			61.46 **
Percent Variance Explained		17.5%	40.3%

* p<0.01; ** p<.001; ‡p>.10

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