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Religion and Female Educational Attainment

The paper reviews the literature on the education, gender, and religion nexuses and identifies plausible hypotheses that religion adversely affects female education. The link between major religions and female educational attainment is examined using the Barro-Lee data set for a sample of 97 countries. The estimates include control variables for colonial heritage, urbanization, labor force participation, and young adult mortality. The estimates show powerful negative links between female educational attainment and the proportion of ethnoreligions, Hindu, and Muslim adherents in a country, with similar results for the gender gap. The paper offers some interpretative thoughts and research agendas.

JEL codes: I2, J0, J1, O1, Z1

Keywords: educational attainment, gender, religion.

HUMAN CAPITAL IS but one factor affecting economic growth. In fact, much of a country's productivity advances can be explained by increased human and physical capital (Baier, Dwyer, and Tamura 2006). By numerous accounts, female education is an important determinant of economic growth and human well-being. Summers (1992) argues that female education is the most important opportunity available for investing in the well-being of residents in the world's poorest economies. More recently, Behrman et al. (1999) find that investing in female education attainment will increase the stock of children's human capital. Therefore, investment in female

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education also has potentially powerful positive lagged effects on economic growth besides any direct effects on current economic growth.

Despite the potential benefits of female education, it is widely documented that there is a substantial gap in male and female education; the common expression is “the educational gender gap” (e.g., Todaro 1997). In that vein, Marshall (1985) finds that economic development is associated not only with increased female secondary enrollments but also with greater gender equality in secondary enrollments. More generally, Todaro (1997, p. 386) argues that increasing female educational attainment and reducing the gender gap will not only enhance economic growth but will also improve the quality of life. Specifically, Todaro builds a case for investing in female education by noting the existence of higher rates of return for investment in female education compared to male education in developing countries. Todaro also notes that increased labor force participation and corresponding later marriages, reductions in fertility, and improved nutrition result from increased investment in female education. Finally, Todaro notes that investment in female education should help relieve the burdens of poverty because women bear a disproportionate cost of poverty.

There are two issues regarding female schooling: (i) the determinants of the level of female education itself and (ii) the existence and determinants of the gender gap or the schooling investment of females relative to males. The educational gender gap may get more attention in the literature, but the more basic question is what determines the level of female education? Presumably, if some countries underinvest in female education, well-being is retarded even if the male–female gap equals zero or even if the gap favored women. In the present paper, we attempt to explain both the level of female educational attainment and the gender gap in educational attainment by focusing on the explanatory power of religion with some accounting for control variables. There is little formal theory regarding this issue. For example, Barro and Sala-I-Martin (1995, p. 432) contend that the gender gap is attributable to a generalized “backwardness.” More to the point, based on related literatures in economics and sociology, we have reason to believe that religious beliefs may explain the considerable variation in the level of female educational attainment and the gender gap in educational attainment as well.

1. BACKGROUND

1.1 Education, Gender, and Growth

Psacharopoulos (1994) finds that primary education is the most important investment priority in developing countries, that returns decline with education level and per capita income, and that women’s education generally shows a higher return than that for men. Barro (1999a) finds that educational attainment levels for males at the secondary and higher levels is more related to economic growth than is female attainment or primary level male attainment. Presumably, the weak female-schooling effect means that women’s human capital is not well utilized in labor markets in many countries. Parrado (1998) asserts that educating all segments of a society is

critical to modernization in developing countries; indeed, in most countries in this century, women's years of schooling have increased more than men's. In industrially advanced, high-income countries, as well as in Latin America and to a lesser extent in Southeast and East Asia, women's and men's levels of schooling are nearly equal. Not only have these countries expanded public education (Topel 1997), but also rates of return on education and other human capital measures are higher in developed countries, as birth rates decline, wage rates rise, and more married women enter the labor force (Becker, Murphy, and Tamura 1990). Investment in education has a health component as well. Tamura (2006) finds that rates of return to education are higher in countries with lower young adult mortality.

Despite reasoned policy arguments to the contrary, the educational gender gap is still large. In most countries in South and West Asia and North and sub-Saharan Africa, women attain only 40%–75% the level of education of men (Schultz 1993). Gender inequalities generally decline with economic growth because of opportunities created by expanding markets (Charles 1992, Clark, Ramsbey, and Adler 1991). Hill and King (1993) find that large gender disparities in education levels appear to reduce GNP; when they hold constant female education level, size of labor force, and capital stock, they find that countries with bigger gender gaps (female enrollment rates less than 75% of male enrollment rates) have a 25% lower GNP than countries with smaller gender gaps.

Between 1965 and 1985, the primary education gender gap was considerably reduced, while secondary school enrollment had bigger gender gaps. In countries with a greater gender gap, the negative effect of education on fertility was weaker. In countries with a smaller gender gap, defined as female enrollment rates greater than 75% of male enrollment rates, fertility levels and infant mortality associated with a specific primary enrollment level were much lower and per capita GNP and male life expectancy were much higher.

Fogel (1990) theorizes that investments in women's human capital stock may have increased for a number of reasons. Private rates of returns on investment in women's human capital have increased relative to private returns on other investments, including men's human capital. Society may value the greater external benefits resulting from improved women's human capital. Parents with rising incomes may choose to invest equally in sons and daughters. Increasing women's education positively affects their health, longevity, and welfare for themselves as well as for their families, and family size decreases (Cochrane et al. 1980, Schultz and Tansel 1992, Strauss et al. 1993). Increasing women's education levels generally results in high individual private market returns, reduced child mortality and fertility, better health and education of children, and increases in the income potential of poorer individuals (Hill and King 1993, Schultz 1993). As fertility decreases, the proportion of family income invested in each child's human capital stock increases, resulting in increased per capita income (Hill and King 1993, Zhang 1997).

Tamura and Sadler (2000) explore the relationship between investment in education and the skill level of parents. They theorize that unskilled parents have higher fertility rates and higher mortality rates, both of which result in less education investment per

child. Also, unskilled parents will be more likely to invest unequal amounts in each child's education. As skill levels rise, however (e.g., as a society's labor force moves away from agriculture), families have fewer children and invest in their children's education more equally—resulting in a smaller gender gap, as well as higher education attainment levels for females.

1.2 Religion and Growth

The literature contains many analyses of the relationships between religion and economic growth as well as between education and economic growth. A logical link between religion and economic growth is the link between religion and education. To the extent that religion enhances or retards investment in education, religion in turn enhances or retards economic growth. In the analysis subsequently presented, we explore the nexus between religion and education by examining whether a country's dominant religious affiliations are related to women's educational attainment levels and any educational attainment gender gap.

Religion and economic growth were prominently linked by Max Weber (1930), who asserted that the Protestant Reformation was the primary cause of economic development through the growth of capitalism. Even though Becker and Woessman (2007) claim that economic development was due to literacy gained through Bible reading, rather than Weber's Protestant work ethic, higher economic growth was linked to Protestantism—whether through work ethic or literacy. Grier (1997) offers more contemporaneous empirical support for Weber's hypothesis. Grier examines the lower economic growth rates of ex-colonies and finds that the growth rate of Protestantism is correlated with real GDP growth. Grier claims that while religion is not the sole determinant of economic development, Protestantism is one factor determining economic progress. More recently, Barro and McCleary (2003) find that the prevalence of strong religious beliefs as opposed to mere church attendance or specific religious adherence stimulates economic growth.

Other scholars vigorously oppose the Weberian tradition. Samuelsson (1993) bluntly challenges Weber's theory by claiming that economic progress is uncorrelated with religion, that nearly all the capitalist institutions emphasized by Weber preceded the Protestant Reformation, and that capitalism, therefore, could not have been caused by the Reformation. He proposes instead a reverse causality with the possibility that merchants and industrialists may have favored Protestantism disproportionately because it offered more freedom and a more convenient secular lifestyle option. Samuelsson asserts that the founding fathers of Protestantism, far from favoring capital accumulation, were ambivalent about wealth and that early Protestant theologians were largely indifferent and ignorant of economic matters and markets.

Delacroix (1995) finds no evidence that one religious group outperforms the other when comparing levels of economic development between European Catholic and Protestant countries. Similarly, Fanfani (1939) debunks the relationship between religion and economic growth by arguing that religion is conducive to growth insofar as it is separate from a country's political and economic life. He claims that all

religions are negatively related to growth and that the separation of church and state that occurs in many predominantly Protestant countries is the impetus behind economic development.

More nuanced scholarship also exists. A traditional argument in the sociology of religion is that Protestants have a distinct economic work ethic that promotes upward economic mobility (Kalmijn 1991). Glaeser and Glendon (1998) document a stronger correlation between economic growth rates and religiosity among Protestant countries (where more than half the population is Protestant) than among Catholic countries before 1950; after 1950, the growth rates between Catholic and Protestant countries are similar. They postulate that Protestant countries more readily adopted capitalist methods, and eventually Catholic countries also adopted these technologies, resulting in the eventual convergence of growth rates after 1950. Other social scientists also note a negative correlation between Catholicism and economic growth (Harrison 1985). Morse (1964) argues that Hispano-Catholic tradition is less conducive to development than Protestantism and that Protestant virtues of hard work and individualism promote savings, which then provide funds for capital investment. Lenski (1961) finds that Protestants are somewhat more approving of capitalist norms and that some elements of Protestant theology, such as permitting usury, are more supportive of capitalism (Glaeser and Glendon 1998). Andreski (1969) notes that most of the literature supports the hypothesis that Latin American Spanish-speaking countries, which have historically been considered Catholic countries, possess characteristics not generally related to growth (proclivity toward authoritarian government and religion, disdain for the work ethic, and lack of public spirit). Some researchers argue that because of Catholicism's focus on the "other world," workers in these countries place less importance on the work ethic and economic development than do Protestants. Andreski also argues that Catholic societies are more prone to communism than are Protestant countries, which would have resulted in lower levels of economic growth.

Linking religion indirectly to economic growth, Grier (1999) finds that level of education at the time of independence explains much of the development gap between former British (predominantly Protestant) and French African (predominantly Catholic) colonies. Newly independent African British colonies were more educated than the French colonies, primarily because of differences in educational philosophies between the British and the French. The British taught in the vernacular languages and trained indigenous teachers, whereas most of the teachers in the French colonies came from France and students were required to speak French, and since education was primarily through boarding schools, very few French Africans received a colonial education. Corbett (1972), citing language of instruction as the reason for the divergent attendance rates, finds that only one-third of first graders in French African schools actually complete primary school, compared to three-fourths of British African students.

Religious affiliation and education can be related to economic growth through the democracy level of a country (Lipset 1994, Barro 1999b). Barro (1999b) finds that the "propensity for democracy," as measured by strength of electoral rights and civil liberties, rises with per capita GDP, primary schooling, and smaller primary

education attainment gap. He provides two possible explanations for this relationship: (i) the primary education attainment gender gap proxies for general inequality of education and income or (ii) a social structure that provides more female educational opportunities is more receptive to democracy. Protestant countries are nearly always highly democratic, and Muslim countries are not; between these two groups are countries that are dominated primarily by Catholic or tribal religions.

1.3 Religion and Education

Many research studies have examined religion and education variables in a variety of contexts. For example, Lehrer and Chiswick (1993) find that marriage stability in the United States increases with similar religious background and with college education. Internationally, cultural norms can be an important factor in women's educational level and involvement in the labor force. In less developed countries, high infant mortality rates and normative beliefs in the value of large families result in gender role differentiation that is often supported by religious codes and by institutionalized authority structures; in developed countries, demographic trends do not support such strong gender role differences, although traditional norms and values still exist in varying levels in most countries (Malik 1995). Boserup (1970, p. 97) claims that "cultural traditions, including the role of women in the traditional sector of market trade, seem to be a more important factor in determining the place of women in the modern trade sector than is the stage of general 'modernization' achieved by the country." Kuran (1997), in his discussion of underdevelopment in Islamic countries, cites religion as an obstacle to free thinking and innovation. While many of the poorest countries are predominately Muslim and even though as late as the mid-twentieth century, Muslims were "overwhelmingly illiterate," Kuran (1997) suggests that Islamic link between religion, education, and growth is that the Islamic educational tradition of memorization did not lend itself towards modern economic development.

Marshall (1985) found in a cross-sectional analysis of 60 third world countries that religion is a significant predictor of national variations in gender inequality. Several researchers have found lower labor force involvement in Islamic and Latin American countries (Clark et al. 1991, Marshall 1985, Pampel and Tanaka 1986). Muslim and Latin American countries show relatively higher level of gender inequality, as measured by life expectancy, education, and income, and these countries are more likely to have patriarchal institutional arrangements that promote greater gender inequality (Forsythe et al. 2000). Kuran (2003, 2004) claims that the Middle East is underdeveloped because Islamic institutions constrain economic development and growth. The relatively higher cost of economic activity would, therefore, decrease the return to investment in education in Muslim countries. Kuran does not claim that Islam is the cause of lower economic development but rather that traditional Islamic institutions that worked well in earlier centuries became the sources of inefficiency (and therefore resulted in low growth) in the modern world of larger enterprises and economic modernization. Borooah and Iyer (2005) also find religion to influence

enrollment rates in India. Initial enrollment rates were highest for Hindus, then Muslims, then Dalits. In this case, religion affects caste, which reflects the family's ability to provide education. Cultural/religious or caste norms may also reflect gender-specific educational levels. If the goal for girls is marriage, then families will invest in less education in their daughters than in their sons, who will be expected to provide for their future families.

Catholic countries (in which more than half the population is Catholic) have on average 15% lower female labor participation rates than Protestant countries (Tzannatos 1999); religion alone, therefore, can explain more than one-third of the cross-country variation in female labor force participation rates. Other determinants of the education gender gap are parents' education, family income, alternative demands on students' time, societal attitudes toward female education, and opportunities for female employment (Hill and King 1993). Even in the United States, Darnell and Sherkat (1997) find that values held by specific religious groups may affect parental encouragement of college education for their children. Lehrer (1999, 2004) finds that among U.S. non-Hispanic whites, Jews have the highest educational attainment and conservative Protestants have the lowest levels. Chiswick (1988) theorizes that greater educational attainment among Jews is due to smaller family size, allowing parents to invest more resources into their children's education.

In summary, the considerable research reported in the literature on religion, education, and economic growth leads to the hypothesis that the education gender gap is smaller in countries with a larger proportion of Protestant adherents than Roman Catholic, Muslim, or traditional/indigenous religions. Similarly, the literature also implies that female educational levels should be related to the same religious variables and with the same testable hypotheses.

1.4 Control Variables

Sachs and Andrew Warner (1997) argue that productive economic behavior is more costly in tropical environments. If they are correct, then education as productive economic activity should be diminished in tropical areas. Moreover, since all other economic activity is diminished, the returns to investment in education should likewise be diminished. Thus, tropical climates should reduce investment in education for either gender, although an unambiguous prediction about the relative magnitude for males versus females is unclear.

Lucas (1988) observes that economic growth rests firmly on human capital investment and that human capital investment is strongly related to urbanization. Urbanization magnifies the external effects of human capital; consequently, the returns of investing in human capital should be greater in urban environments. Alternatively, the costs of not investing in human capital increase with urbanization. Accordingly, we should observe greater investment in human capital for both females and males as urbanization increases.

Colonial heritage also merits inclusion as a control variable, since it can be linked with religion. Grier's (1997, 1999) analysis finds that the link between colonial

heritage and economic growth can be complicated. Grier found that British colonies had more effective investment in schooling than French colonies at the time the colonies became independent, but not generally in postcolonial history. Critics of imperialism and colonialism might argue that the most colonial systems were largely extractive and ignored the social infrastructure and thus the absence of a colonial heritage would enhance incentives to invest in schooling. Preliminary estimates with the present data suggested that the inclusion of dummy variables for the British colonial heritage and a dummy variable for no colonial heritage were the only consistent significant colonial variables. Thus, the intercept captures the effects of all other colonial heritages.

Tamura (2006) develops a model of fertility and human capital investment where young adult mortality decreases the incentive to invest in schooling. Moreover, Tamura finds that empirical evidence is consistent with the model. Both the logic and the data are compelling. Accordingly, young adult mortality merits inclusion in the model.

It is also the case that higher female labor force participation rates can create incentives to invest in schooling. That result is more likely if schooling is required for many jobs. However, labor force participation at certain levels—e.g., higher education—could be a substitute for schooling and might be expected to decrease formal education. Given either possibility, female labor force participation should also serve as a control variable.

1.5 Testable Hypotheses

Six hypotheses regarding nonreligious explanations for female education are natural extensions from past research. British colonial heritage enhances female education as does the absence of a colonial heritage. Tropical climates retard investment in human capital. Urbanization enhances female education, whereas young adult mortality should retard investment in education. Labor force participation could have either positive or negative effects on female educational attainment.

The economics and sociology literature suggests that Protestantism enhances female education. Catholicism, Islam, and traditional, indigenous religions are, therefore, hypothesized to retard investment in female educational attainment.

2. EMPIRICAL ANALYSIS

2.1 Data

Empirical research on educational attainment involves numerous measurement problems. Input measures such as enrollment rates do not provide an accurate measure of the stock of human capital. Output measures such as adult literacy also do not provide a good picture of educational attainment because they describe only the most rudimentary levels of educational attainment. Moreover, various models of economic growth developed by Lucas (1988), Becker, Murphy, and Tamura (1990), Rebelo (1991), and Mulligan and Sala-I-Martin (1993) measure human capital in the form of educational attainment or the number of school years completed.

TABLE 1
FEMALE EDUCATIONAL ATTAINMENT LEVELS

Female education attainment	Mean	Std. dev.	Minimum	Maximum
No schooling	30.5	26.5	0.0	91.2
Example	Botswana ^a		Japan & New Zealand	Mali
Primary attainment	35.2	14.3	6.9	69.6
Example	Netherlands ^b		Mali	Lesotho
Secondary attainment	24.3	15.6	1.5	60.1
Example	Peru ^c		Niger	Norway
Higher education attainment	10.0	10.2	0.1	53.5
Example	Switzerland ^d		Mozambique	Canada

NOTES: Data are for the population aged 15 years and above. Example for means is an observation close to the sample mean. Minimum and maximum are extreme sample observations. a = 29.3; b = 35.3; c = 25.0; d = 10.2.

SOURCES: See also Table A1.

Barro and Lee (1993) estimate the number of school years completed for persons aged 15 years and above and aged 25 years and above using a perpetual inventory approach. While their measure does not adjust for important dimensions beyond educational attainment (e.g., quality), the measure seems to be a reasonable representation of the existing stock of human capital in a nation-state. The data include proportions of various education levels attained by a country's population over 15 years old. Using the limit of 15 years provides a closer fit for the age levels for marginal decisions regarding further educational investment and fits more closely with the 1995 religion data available from Barrett, Kurian, and Johnson (2001).

Table 1 contains descriptive statistics for female educational attainment levels for the sample of 97 countries for which the updated Barro–Lee and Barrett, Durian, and Johnson religion data are all available (see Table A4). The data reveal some striking results, both in the attainment levels and the dispersion between countries. First, many women in the world have absolutely no formal education. While the 97 countries have, on average, 30.6% unschooled women, the range is large. For example, virtually no women in Japan and New Zealand are unschooled compared to over 90% of the women in Mali. At the other end of educational attainment—some higher education—the sample average percentage is 10%. The dispersion for this measure is also large—hardly any women (only 0.10%) in Mozambique but over half (53.5%) of the women in Canada have at least some higher education. In short, women's educational attainment levels are extremely disparate around the world.

The data in Table 1 also show one of the pitfalls of using the Barro–Lee attainment data. The measure reflects the highest level of educational attainment, so that a low percentage for primary attainment may be caused by two very different scenarios. The percentage might be low because most women in that country go beyond primary education, or the percentage might be low because few women ever attend school—two very different conclusions about women's education. Nevertheless, in all cases, the most salient point in Table 1 is the remarkable dispersions—in terms of the ranges of the data and the standard deviations. Female educational levels vary across nations. Thus, there is a natural question: What accounts for such dispersion?

TABLE 2

EDUCATIONAL ATTAINMENT GENDER GAP: FEMALE LEVEL MINUS MALE LEVEL

Gender gap	Mean	Std. dev.	Minimum	Maximum
Unschooler	8.6	10.5	-12.6	32.5
Example	Sri Lanka ^a		Lesotho	Togo
Primary attainment	-2.4	8.3	-27.1	19.7
Example	Indonesia ^b		Uganda	Austria
Secondary attainment	-3.6	6.5	-22.6	10.9
Example	Senegal ^c		Ghana	Australia
Higher education attainment	-2.6	3.1	-17.2	3.4
Example	Malaysia ^d		Korea	Philippines

NOTES: Data are for the population aged 15 years and above. Example for means is an observation close to the sample mean. Minimum and maximum are extreme sample observations. a = 8.70; b = -2.6; c = -3.5; d = -2.6.

Table 2 contains the gender gap data—the absolute differences between male and female percentages for the four levels of educational attainment. The positive gap for the unschooled category means that, on average, a higher percentage of women are uneducated compared to men (more than 8 percentage points higher) in the sample of 97 countries. The negative values for the other measures indicate that larger percentages of males than females have attained primary, secondary, and higher education levels. Thus, the Barro–Lee data document substantially low levels of female education and systematic gender gaps at all education attainment levels.

2.2 Determinants of the Female Educational Attainment Levels

To examine potential determinants of female education attainment levels *per se*, we estimate:

$$\log\text{-odds}(EA_{fi}) = \delta_1 + \delta_1 R_1 + \cdots + \delta_8 R_8 + \delta_9 C_1 + \cdots + \delta_{14} C_6 + \varepsilon_{1i}, \quad (1)$$

where EA represents the respective measure of female educational attainment in a nation, R represents religious variables, C represents the various control variables, and ε_{1i} is the error term.¹

Table 3 contains the results of estimates of equation (1).² The control variables provide a mixed picture. The difficulties with primary educational attainment—a simultaneous trade-off with no schooling and higher education—are evident in that the goodness of fit is much lower for this category and none of the control variables is

1. The log-odds ratio is defined as:

$$\ln[P_i/(100 - P_i)],$$

where P_i represents the percentage attaining the respective educational attainment level. The number 1 is added to the proportion of unschooled measure to prevent taking the log of 0. Preliminary, unreported, estimates indicated that using percentages instead of the log-odds transformation does not dramatically alter the results reported in the paper. The dependent variables are estimated as proportions except for the mortality and women in the labor force. The last two variables are estimated as natural logs.

2. White's (1980) heteroskedasticity-consistent covariance estimators are used.

TABLE 3
DETERMINANTS OF FEMALE EDUCATIONAL ATTAINMENT

Variable	Regression coefficient/(t-statistic)			
	Unschoolcd	Primary	Secondary	Higher
Intercept	-1.793 (-1.05)	1.476 (0.88)	3.672 (2.35)	3.425 (1.98)
Buddhist	-0.228 (-0.35)	0.026 (0.05)	-0.491 (-0.87)	0.882 (1.07)
Ethnoreligions	1.480 (1.68)	-1.002 (-1.32)	-1.720* (-2.45)	-1.944* (-2.00)
Hindu	1.420* (2.25)	-0.823 (-1.09)	-0.887 (-1.69)	-0.952 (-1.15)
Muslim	1.631** (2.94)	-1.206** (-2.82)	-1.694** (-4.04)	-0.988* (-2.05)
Nonreligious	0.377 (0.22)	-0.862 (-0.66)	-0.092 (-0.09)	-1.500 (-1.37)
Orthodox	0.381 (0.68)	0.181 (0.45)	-0.629 (-1.69)	-0.103 (-0.24)
Protestant	-0.904 (-1.47)	-0.245 (-0.53)	0.008 (0.02)	0.041 (0.09)
Roman Catholic	-0.147 (-0.24)	0.336 (1.03)	-0.804 (-1.94)	0.098 (0.22)
British	-0.752** (-3.31)	0.249 (1.21)	0.603** (2.84)	0.071 (0.31)
No colony	-0.270 (-1.33)	0.292 (1.34)	0.347 (1.77)	-0.290 (-1.23)
Urban	-1.319* (-2.18)	-0.358 (-0.79)	1.054* (2.25)	1.800** (3.16)
Tropics	0.253 (0.98)	0.317 (1.58)	0.008 (0.04)	-0.379 (-1.36)
Mortality	0.881** (6.22)	-0.059 (-0.46)	-0.437** (-3.00)	-0.873** (-5.87)
Women Lab. Force	-0.237 (-0.58)	-0.527 (-1.34)	-1.159** (-3.19)	-1.323** (-3.57)
Adj. R ² /S.E.R	0.844/0.661	0.300/0.607	0.734/0.555	0.790/0.737

NOTE: **, * denotes statistical significance at the 5% and 1% levels, respectively.

significant. For individual variables, the tropics variable is weakest, as it is not significant for any of the estimates. Negative coefficients for women's labor force participation suggest some substitution of employment for schooling. The categorical variable denoting the absence of colonial past is marginally significant with the positive predicted sign but only for secondary school attainment. The categorical variable for a British colonial heritage shows a significant decrease for the proportion of the female population who are unschooled and a significant increase for the proportion that attain secondary education. The urbanization and mortality measures are significant for all but the primary attainment category. Urbanization increases the proportion of females attending both secondary and higher education, with a particularly strong effect on higher education. A one standard deviation increase in urbanization (0.238) would increase the log-odds of female higher education by 0.428.³ That result implies an

3. The standard deviation values are shown in Table A2.

increase at the sample mean of 10% to nearly 14% ($\Delta = 3.93\%$). The estimated coefficient for mortality is more robust statistically and not trivial economically. A one standard deviation increase in young adult mortality would increase the log-odds of unschooled females by 0.802. That implies an increased percentage of unschooled females of 18.5%.⁴ A comparable decrease in young adult mortality would increase the percentage of females attaining higher education by about 7% (7.4%). Although the estimated coefficients for mortality are approximately the same in absolute value, the mean proportion of the unschooled is more than three times greater than the proportion of females attaining higher education. Consequently, the effect on the unschooled population is greater than the effect on the higher educational attainment.

The effect of the religious variables varies. Buddhist, Protestant, and nonreligious adherents do not seem to affect female education. The indirect Protestant ethic effect, therefore, is completely absent. There is some evidence, however, of a negative Catholic effect for secondary educational attainment, which was also found for Orthodox and Hindu adherents. The other two religious variables—ethnoreligions and Muslims—have more effect on female education. The Muslim proportion is statistically significant for all the categories—an increased proportion of women who are unschooled and decreased proportions for women attaining primary, secondary, and higher education. The ethnoreligious effect is also adverse to women—lower proportions of women attaining both secondary and higher education.

The magnitudes of the religious variables' coefficients are palpable. The effect of a hypothetical one standard deviation increase in the proportion of ethnoreligions, Hindu, and Muslim populations would increase the percentage of unschooled females by 3.5%, 3.9%, and 12.2%, respectively. At the secondary attainment level, the corresponding effects would be decreased female secondary attainment of 3.5%, 2%, and 9.9%. For higher education, a one standard deviation increase in ethnoreligions and Muslim proportions would reduce female attainment by about 1.9% and 2.9%, respectively.⁵ Both numbers are hardly trivial given the sample mean of only 10% for higher educational attainment.

2.3 Determinants of the Gender Gap

The determinants of the gender gap are examined by estimating equations (2)–(4).

$$\log\text{-odds}(EA_{mi}) = \delta_2 + \delta_1 R_1 + \cdots + \delta_8 R_8 + \delta_9 C_1 + \cdots + \delta_{14} C_6 + \varepsilon_{2i} \quad (2)$$

4. The calculated change using the log-odds form is $dp/dx = p(1 - p)\beta$ where p is the proportion of the population that is unschooled or one of the educational attainment measures for the respective countries. We use the sample mean value for the unschooled proportion or the respective attainment proportion (see Gujarati 1995 p. 555). The young adult mortality is estimated in logs. The standard deviation of the log of young adult mortality is 0.9099.

5. The coefficient for ethnoreligions is about twice as large as the coefficient for Muslim adherents but the standard deviation for Muslims is about three times greater than the standard deviation for the ethnoreligions measure.

$$\begin{aligned} \log\text{-odds}(EA_{fi}) - \log\text{-odds}(EA_{mi}) = & \delta_3 + \delta_1 R_1 + \dots + \delta_8 R_8 \\ & + \delta_9 C_1 + \dots + \delta_{14} C_6 + \varepsilon_{3i} \end{aligned} \tag{3}$$

$$\text{Prob}(BG) = \delta_0 + \delta_1 R_1 + \dots + \delta_8 R_8 + \delta_9 + \dots + C_1 \delta_{14} C_6 + \varepsilon_{4i}. \tag{4}$$

Equation (2) is identical to (1)—which was presented in Table 3—except the educational attainment measures are for males. Equation (3) represents the gap between the female measures in (1) minus the male measures in (2). The result is a specification of the log-odds gender gap. Equation (4) represents big gender gaps—defined to be a gap greater than one standard deviation above the mean gap for the sample educational attainment measures.

The results for equation (2) are shown in Table 4. The first salient feature is that the explanatory power of the estimates is uniformly lower for the male estimates

TABLE 4
DETERMINANTS OF MALE EDUCATIONAL ATTAINMENT

Variable	Regression coefficient/(t-statistic)			
	Unschoolcd	Primary	Secondary	Higher
Intercept	-2.069 (-1.30)	1.697 (1.12)	0.867 (0.52)	2.043 (1.24)
Buddhist	-0.348 (-0.53)	-0.073 (-0.17)	-0.211 (-0.36)	0.402 (0.63)
Ethnoreligions	0.615 (0.75)	-0.738 (-1.11)	-0.449 (-0.52)	-0.783 (-0.76)
Hindu	0.331 (0.54)	-0.181 (-0.33)	0.205 (0.43)	-0.406 (-0.59)
Muslim	0.909 (1.86)	-0.697 (-1.83)	-0.721 (-1.65)	-0.678 (-1.55)
Nonreligious	-0.715 (-0.50)	-0.549 (-0.51)	1.053 (0.88)	-0.285 (-0.24)
Orthodox	-0.239 (-0.39)	0.083 (0.23)	0.006 (0.02)	-0.139 (-0.37)
Protestant	-0.746 (-1.25)	-0.548 (-1.32)	0.353 (0.86)	-0.135 (-0.42)
Roman Catholic	-0.193 (-0.39)	0.279 (0.90)	-0.557 (-1.31)	-0.175 (-0.49)
British	-0.648** (-3.37)	0.088 (0.49)	0.515* (2.40)	-0.182 (-0.89)
No colony	-0.300 (-1.63)	0.104 (0.50)	0.439* (2.13)	-0.298 (-1.51)
Urban	-0.854 (-1.74)	-0.761 (-1.80)	1.027* (2.04)	1.569** (3.34)
Tropics	0.255 (1.21)	0.413* (2.23)	-0.185 (-0.88)	-0.323 (-1.43)
Mortality	0.814** (6.52)	-0.041 (-0.33)	-0.200 (-1.34)	-0.621** (-5.18)
Women L.F.	-0.243 (-0.63)	-0.509 (-1.42)	-0.563 (-1.44)	-0.907** (-2.48)
Adj. R ² /S.E.R	0.785/0.651	0.235/0.580	0.550/0.612	0.721/0.639

NOTE: *,** denotes statistical significance at the 5% and 1% levels, respectively.

compared to the estimates for females in Table 3. The adjusted *R*-squared measures fall from 0.844 to 0.785, 0.300 to 0.235, 0.734 to 0.550, and 0.790 to 0.721, for the unschooled, primary, secondary, and higher education estimates, respectively. For the control variables, the robustness does not seem much different. Urbanization and no colonial heritage are statistically significant in one additional estimate. Young adult mortality is significant in one less estimate. Participation of women in the labor force is significant for only higher education, instead of both secondary and higher education in Table 3. Tropics is now significant in one estimate. Thus, there is little basis to conclude that the weakened goodness-of-fit for equation (2) versus equation (1) is attributable to the control variables.

Examination of the religious variables in Table 4 shows that the reduced goodness-of-fit stems from weaker religious variables. Three religious variables—Buddhist, nonreligious, and Protestant—are never statistically significant in either Table 4 or Table 3. Four religious variables—Catholic, Orthodox, Hindu, and ethnoreligious—are never statistically significant in Table 4, whereas they were significant in seven of 16 estimates in Table 3. For the Muslim proportion coefficients, the estimates are significant for three of the four estimates, compared with all four estimates in Table 3. However, the estimates are more robust in the female case—significant at the 1% level for three estimates and 5% for one estimate, whereas the estimates for males are significant at the 10% level for the three estimates. Moreover, the coefficients in the male estimates are all smaller in absolute value compared to the female estimates.⁶

The second test is more direct and can be found in the gender gap estimates in Table 5. The control variables shift a bit with urbanization playing a smaller role and women's labor force participation rates becoming a bit more important. However, the data also document strong gender gaps linked with the religion variables. The proportion of Orthodox adherents increases the gender gap for the unschooled proportion and for secondary attainment favoring males in both cases. As in Table 3, the biggest effects are found for the estimates for ethnoreligions, Hindu, and Muslim proportions. In this case, the larger and more robust gender gaps are associated with the Hindu and Muslim proportions.

Table 6 contains the results of probit estimates for the presence of a big gender gap, measured as value equal to 1 if the male advantage exceeds the sample average plus one standard deviation for the respective category, and 0 otherwise. For example, the sample average for the unschooled gender gap (percentage of unschooled females minus unschooled males) is approximately 8.628. The standard deviation is approximately 10.541. So, if the gap exceeds about 19.169, the dependent variable equals 1. If the gap is less than about 19.169, the dependent variable equals 0.

The results of the probit regression estimates are notably different from the results in the other tables. The ethnoreligions, Hindu, and Muslim proportions play no role, while the nonreligious variable is positive and significant for secondary education.

6. Tests of restricted coefficients indicate that we can reject the null hypothesis for identical coefficients only for two Hindu estimates (unschooled and secondary attainment) and one Muslim estimate (secondary).

TABLE 5
DETERMINANTS OF FEMALE/MALE GENDER GAP IN EDUCATIONAL ATTAINMENT

Variable	Regression coefficient/(t-statistic)			
	Unschool ed	Primary	Secondary	Higher
Intercept	0.276 (0.25)	-0.221 (-0.30)	2.805 (3.32)	1.383 (1.20)
Buddhist	0.120 (0.30)	0.099 (0.36)	-0.280 (-0.99)	0.480 (1.01)
Ethnoreligions	0.865 (1.29)	-0.263 (-0.53)	-1.271 (-1.84)	-1.160 (-1.58)
Hindu	1.090* (2.50)	-0.642 (-1.74)	-1.092** (-3.33)	-0.546 (-1.46)
Muslim	0.722* (1.93)	-0.510* (-1.97)	-0.973** (-3.44)	-0.309 (-0.87)
Nonreligious	1.092 (0.77)	-0.313 (-0.48)	-1.146 (-1.61)	-1.215 (-1.62)
Orthodox	0.620 (1.65)	0.098 (0.41)	-0.635** (-3.10)	0.037 (0.12)
Protestant	-0.157 (-0.43)	0.303 (1.15)	-0.344 (-1.38)	0.176 (0.63)
Roman Catholic	0.046 (0.13)	0.057 (0.23)	-0.247 (-1.09)	0.272 (0.97)
British	-0.104 (-0.74)	0.161 (1.25)	0.088 (0.71)	0.253 (1.73)
No colony	0.030 (0.26)	0.188 (1.49)	-0.093 (-1.01)	0.009 (0.05)
Urban	-0.465 (-1.21)	0.403 (1.95)	0.027 (0.11)	0.231 (0.77)
Tropics	-0.002 (-0.01)	-0.096 (-0.83)	0.193* (1.99)	-0.056 (-0.36)
Mortality	0.067 (0.75)	-0.018 (-0.27)	-0.237** (-3.74)	-0.252** (-2.97)
Women L.F.	0.006 (0.03)	-0.018 (-0.10)	-0.596** (-2.93)	-0.416 (-1.74)
Adj. R ² /S.E.R	0.338/0.436	0.415/0.330	0.500/0.349	0.482/0.421

NOTE: **, * denotes statistical significance at the 5% and 1% levels, respectively.

Also, largely irrelevant religions in the previous tables have negative coefficients with relatively small standard errors indicating significantly lower probabilities of a large gender gaps—unschool ed and secondary education for Buddhists and unschool ed and primary categories for Protestants and Catholics. In results not reported in Table 6, excluding the Buddhist, Catholic, and Protestant variables led to significant positive coefficients especially for the ethnoreligions, as well as for Orthodox, nonreligious, Hindu, and Muslim. Strong results are evident at low levels of education. Thus, big gender gaps do exist in countries where those religions are heavily represented. However, for the fully specified equation, the adverse effects on big gender gaps are null. Instead, the dominant effect is the reduction of big gender gaps in countries where Buddhist, Catholic, and Protestant adherents are prominent. The probability of big gender gaps conditional on the presence of those religions is reduced compared to the rest of the sample.

TABLE 6
 PROBIT ESTIMATES OF BIG GENDER GAP: GREATER THAN ONE STD. DEV. ABOVE MEAN

Variable	Regression coefficient/(t-statistic)			
	Unschoolcd	Primary	Secondary	Higher
Intercept	11.575 (2.36)	5.986 (1.30)	4.082 (0.94)	4.780 (1.22)
Buddhist	-5.896* (-2.53)	-14.331 (-1.06)	-3.804 (-1.94)	0.894 (0.71)
Ethnoreligions	-1.924 (-0.73)	-0.015 (-0.01)	1.339 (0.59)	-0.585 (-0.32)
Hindu	-1.060 (-0.58)	1.072 (0.77)	1.337 (1.08)	1.326 (1.06)
Muslim	-1.629 (-0.99)	-1.755 (-1.23)	-0.130 (-0.12)	-0.487 (-0.53)
Nonreligious	3.504 (0.81)	-8.825 (-0.37)	4.477 (1.92)	1.660 (0.51)
Orthodox	-1.380 (-0.74)	-1.180 (-0.89)	-11.452 (-1.01)	0.086 (0.07)
Protestant	-6.838* (-2.25)	-9.134* (-2.10)	0.444 (0.40)	-1.231 (-1.29)
Roman Catholic	-3.221 (-1.84)	-2.465 (-1.79)	-0.776 (-0.82)	-0.770 (-0.91)
British	-0.480 (-0.77)	-0.990 (-1.66)	0.379 (0.69)	-0.361 (-0.90)
No colony	-0.148 (-0.25)	-0.688 (-1.03)	1.080 ^b (1.99)	-0.211 (-0.47)
Urban	-4.351* (-2.33)	-1.426 (-0.85)	-2.577* (-1.92)	1.483 (1.36)
Tropics	0.075 (0.11)	-0.109 (-0.16)	-0.041 (-0.08)	-0.254 (-0.59)
Mortality	0.935 (1.59)	0.700 (1.75)	0.091 (0.25)	0.231 (0.74)
Women L.F.	-2.986* (-2.50)	-1.523 (-1.36)	-1.296 (-1.28)	-1.570 (-1.68)
R ² /S.E.R	0.557/0.302	0.431/0.320	0.281/0.320	0.162/0.475

NOTE: *,** denotes statistically significant at the 5% and 1% levels, respectively. R² is McFadden's R².

3. ENDOGENEITY AND PATH DEPENDENCY

The data suggest that three categories of religion adherence—ethnoreligions, Hindu, and Muslim—retard investment in schooling. One potential complicating factor in these estimates is potential endogeneity of religious adherence and thus biased and inconsistent parameter estimates of the effect of religion on education. The logic of the argument is that religion can result in more education, as was tested in equations (1)–(4), but conceivably education can also influence religion. For example, the rise of secularism with higher levels of education would be *prima facie* evidence of education affecting religious adherence.

To examine that proposition, we performed Hausman tests on the endogeneity of the religious variables. Those (unreported) results indicate that religion is not generally endogenous. Of the 32 estimates of second-stage Hausman estimates, only one is significant at the 1% level and only two are significant at the 5% level. In addition,

TABLE 7
FEMALE EDUCATIONAL ATTAINMENT AND TURN OF CENTURY RELIGION

Variable	Regression coefficient/(t-statistic)			
	Unschool ed	Primary	Secondary	Higher
Intercept	-3.191 (-1.89)	1.285 (0.84)	3.769 (2.50)	1.592 (0.80)
Buddhist	0.189 (0.24)	-0.220 (-0.47)	-0.687 (-1.43)	1.431* (2.01)
Ethnoreligions	0.710 (1.01)	-0.302 (-0.82)	-0.579 (-1.42)	-0.116 (-0.20)
Hindu	2.033** (2.68)	-1.053 (-1.63)	-0.946* (-2.06)	-0.559 (-0.62)
Muslim	2.287** (3.13)	-1.337** (-3.24)	-1.728** (-3.84)	0.004 (0.01)
Nonreligious	15.524 (0.68)	-47.844 (-1.50)	-42.422* (-2.48)	13.451 (0.47)
Orthodox	0.596 (0.82)	0.142 (0.30)	-0.864* (-2.39)	0.790 (1.44)
Protestant	-0.488 (-0.71)	-0.445 (-1.03)	-0.243 (-0.61)	0.923 (1.88)
Roman Catholic	0.228 (0.31)	0.220 (0.64)	-0.850* (-2.07)	1.004 (1.85)
British	-0.752** (-3.35)	0.329 (1.54)	0.655** (2.95)	0.208 (0.86)
No colony	-0.306 (-1.48)	0.325 (1.54)	0.346 (1.68)	-0.302 (-1.22)
Urban	-1.260* (-2.06)	-0.140 (-0.30)	1.204* (2.41)	1.640** (3.03)
Tropics	0.265 (1.26)	0.299 (1.63)	-0.082 (-0.37)	-0.310 (-1.14)
Mortality	0.871** (6.64)	-0.136 (-1.09)	-0.597** (-3.97)	-0.816** (-5.34)
Women L.F.	0.044 (0.11)	-0.436 (-1.23)	-1.082** (-2.96)	-1.060* (-2.26)
Adj. R ² /S.E.R	0.846/0.657	0.307/0.604	0.702/0.588	0.791/0.735

NOTE: **, * denotes statistically significant at the 5% and 1% levels, respectively.

four more estimates are marginally significant at the 10% level.⁷ Nevertheless, we cannot completely rule out some endogeneity.

To address the possibility of endogeneity, we pursue two alternative strategies. First, we reestimate equation (1) using observations from the turn of the century—Barrett, Kurian, and Johnson's data for 1900. These are an extreme version of predetermined variables. The results of these estimates are shown in Table 7.

The data in Table 7 are remarkable. The control variables are only modestly different from Table 3. Orthodox, Catholic, and nonreligious adherents decrease female secondary attainment, while 1900s Protestant and Catholic adherents increase female higher education as does the fraction of Buddhist adherents. More to the point, Muslim and Hindu adherents decrease female attainment by increasing the proportion

7. The significant Hausman coefficients were Buddhist for primary education (10%) and secondary (5%), ethnoreligions for higher education (1%), Hindu for higher education (5%), Muslim for unschooled and higher education (both 10%), and nonreligious for secondary (10%).

TABLE 8
DETERMINANTS OF FEMALE EDUCATIONAL ATTAINMENT: TWO-STAGE LEAST SQUARES

Variable	Regression coefficient/(t-statistic)			
	Unschool'd	Primary	Secondary	Higher
Intercept	-3.292 (-1.59)	1.293 (0.77)	4.010 (2.10)	3.266 (1.67)
Buddhist	0.2586 (0.05)	-0.015 (-0.03)	-1.233 (-1.32)	0.193 (0.17)
Ethnoreligions	2.102** (2.54)	-0.919 (-1.11)	-2.644* (-2.09)	-5.342** (-2.44)
Hindu	1.943** (3.18)	-0.778 (-0.98)	-1.738 (-1.74)	-1.698 (-1.41)
Muslim	2.356** (4.06)	-1.129* (-2.36)	-2.378** (-2.67)	-1.739* (-2.01)
Nonreligious	1.096 (0.60)	-0.814 (-0.60)	-7.431 (-1.15)	-2.577 (-1.53)
Orthodox	0.827 (1.68)	0.242 (0.55)	-1.605 (-1.56)	-0.747 (-1.06)
Protestant	-0.449 (-0.79)	-0.183 (-0.35)	-0.842 (-0.76)	-0.734 (-0.96)
Roman Catholic	0.386 (0.67)	0.452 (1.12)	-1.429 (-1.62)	-0.835 (-1.03)
British	-0.665** (-2.87)	0.312 (1.50)	0.500 (1.74)	-0.211 (-0.80)
No colony	-0.267 (-1.12)	0.380 (1.51)	0.395 (1.79)	-0.554 (-1.81)
Urban	-1.212* (-2.00)	-0.385 (-0.86)	0.781 (1.32)	1.896** (3.00)
Tropics	0.28 (1.09)	0.347 (1.59)	-0.241 (-0.76)	-0.421 (-1.37)
Mortality	0.850** (6.44)	-0.059 (-0.45)	-0.582** (-3.30)	-0.725** (-3.94)
Women L.F.	0.034 (0.07)	-0.510 (-1.29)	-0.846 (-1.67)	-1.092** (-2.67)
Adj. R ² /S.E.R.	0.839/0.670	0.298/0.608	0.635/0.650	0.758/0.792

NOTE: *,** indicates statistical significance at the 5% and 1% level.

of unschooled females and decrease primary (only Muslim) and female secondary attainment (both Hindu and Muslim). Thus, these data suggest that, at least for two religions, the impact of religion on education cannot be rejected solely due to endogeneity of religious adherence and that the measured impact is negative for females.

The second strategy to address potential endogeneity is to use two-stage least squares (2SLS). Accordingly, equation (1) is reestimated using regional categorical variables, expanded colonial variables, and the 1900s religious variables as instruments. The results are reported in Table 8.⁸ The results in Table 8 show that increased Orthodox adherents increase the proportion of females who are unschooled. Table 8 shows some strong results for the ethnoreligious category. Increased proportions of ethnoreligions are also shown to increase the proportion of unschooled and decrease

8. Table A3 in the Appendix contains two-stage least squares with all religious variables treated as endogenous. Thus, those results impose greater restrictions on the estimates. Nevertheless, there is still some evidence of limited female educational attainment attributable to ethnoreligions, Hindu, and Muslim proportions as well as a significant Orthodox effect.

the proportion of females who attain secondary and higher education. The results for the Hindu adherents are not as strong but they are evident. The proportion of Hindu adherents increases the percentage of unschooled females and decreases the proportion of females attaining secondary education.

Table 8 also contains estimates showing a retarding effect on educational attainment from Muslim adherence. As in the case of the ordinary least squares (OLS) estimates, the estimates are uniformly statistically significant. Increasing the proportion of Muslim adherents increases the proportion of unschooled females. Increasing Muslim adherents also decreases the proportion of females attending primary, secondary, and higher education. Moreover, the magnitudes of the coefficients are generally greater than those shown in Table 3.

The data in Tables 7 and 8 suggest that the results documented in Tables 3–6 are not simply confounding cause and effect. Religion may be somewhat endogenous but even with some allowance for misspecification due endogenous religion, retarding effects of religion on female education appear to exist.

The two-stage least squares results are admittedly questionable. The current state of the economics of religion does not readily lead to well-specified structural equations for religious adherence. Religion is typically assumed to be exogenous. Perhaps it is not. Nevertheless, the pattern of the two-stage least squares is roughly similar to the simple OLS results.

A more noteworthy point is that the results in Table 7 seem to document exogenous retarding of female schooling attributable to religious adherence. These data show that levels of religious adherence yield substantial explanatory power for female educational attainment nearly a century later. Path dependence is the economic concept used by economic historians to account for long-term persistence of fixed technologies (David 1975, 1985) and fixed institutions (North 1990). The data in Table 7 suggest something akin to path dependence operates in regard to religion and investment in female schooling. Some educational “lock-in” may exist.

4. SUMMARY, INTERPRETATION, AND CONCLUSIONS

The regression analysis results presented in Tables 3–6 show that some control variables significantly affect both the level of female educational attainment as well as the magnitude of the gender gap in education level. The proportion of tropics in a country seems largely irrelevant, contrary to what we might expect from Sachs and Warner. Labor force participation sometimes lowers female educational attainment. The degree of urbanization generally enhances female attainment levels, sometimes robustly. The results are consistent with Lucas’s conjecture. Similarly, young adult mortality strongly retards investment in female schooling, consistent with Tamura’s model. Indeed, the effects for young adult mortality often are greater than those of the religion variables. British colonial heritage enhances female education, as does the absence of a colonial history.

The religious variables provide a mixed picture. Some religions seem to be irrelevant. We find little support for an educational version of the Protestant ethic and little evidence that secularization (nonreligious adherence) is associated with enhanced

female education. However, when Protestant adherence is statistically significant—1900s data, the effect enhances female education. Similarly, Buddhism is largely irrelevant except it enhances higher education attainment. The hypothesis that the proportion of Catholics in a country lowers female educational attainment is supported for secondary educational attainment, but not much else. When 1900s religious data are used, the proportion of Catholic adherents reduces secondary female attainment but increases higher educational attainment.

Examining the gender gap tempers these results somewhat. First, there are some hints of an education-linked Protestant ethic in the sense that strong Protestant adherence diminishes the probability of large gender gaps. Similarly, Catholic adherence never contributes to a gender gap and reduces the probability of a big gender gap.

The most striking results are persistent estimates that are associated with four religious groups. Orthodox adherence is associated with lower proportions of female attainment at the secondary level and a gender gap at the unschooled and secondary levels. Increased proportions of traditional or tribal religions—the ethnoreligions category—leads to lower female attainment levels for all but primary levels as well as more unschooled females using OLS estimates. The ethnoreligions are also associated with gender gaps favoring males. The results for female attainment are quite similar for the two-stage least squares estimates. The proportion of Hindu adherents is linked with lower levels of unschooled and secondary education and with gender gaps at all but the highest level.

The proportion of Muslim adherents produces even stronger results. It is linked with nearly uniform lower levels of female attainment. Notably, seven of eight estimates in Tables 3 and 6 are statistically significant. Frequent gender gaps exist. Notably, three of four estimates in Table 5 are statistically significant.

The interpretation of the result for the Orthodox adherents seems simple enough. There is a marginal but persistent tendency of investment in schooling to be lower as the fraction of Orthodox adherents increases. There is little discussion for religions or related reasons for this phenomenon, but its effects are evident.

Our interpretation of the results for the traditional/tribal and indigenous religions is also straightforward. The negative effects on female educational attainment and female attainment relative to males are largely consistent with observations of Boserup and the conjecture of Barro and Sala-I-Martin that cultural norms in countries with large proportions of traditional populations do not affirm formal female education, especially for higher educational attainment. A similar interpretation may exist for the persistent evidence of low educational attainment for Hindu adherents and common gender gaps. Cultural norms may retard female education. One distinguished economist, Deepak Lal (1995), argues precisely that point and makes the point regarding to the position of Hindu women.

The interpretation of the results for the proportion of Muslims is less clear. Perhaps the lack of clarity exists because economists have devoted considerable attention to economics in largely Muslim contexts. Some scholars, e.g., Ensminger (1997), stress the transaction cost reducing features of Islam and thus the proportion of Muslim adherents should not decrease incentives for investment in female education. Somewhat similarly, Greif (1989, 1994) and Kuran (1997, 2003, 2004) seem to absolve

Islamic beliefs from salient cultural features that would directly lead to reduced female education. However, both Grief and Kuran assert that legal and cultural foundations of Islamic society centuries ago led to institutional features that much later retarded economic expansion. Some of these are nuanced features of commercial and inheritance laws and informal codes of commercial behavior. The effects of these, combined with “lock-in,” Douglass North’s (1990) explanation for institutional inertia, plausibly have contributed to lessened incentives for investment in female education. Our results do not address those stylized facts, but our results do call for further analysis addressing precisely those issues. In fact, combining the examination of investment in schooling and religion with the link between religion and institutions and institutions and human capital are logical research mandates based on the results previously mentioned.

A second research mandate deals with changes over time. Sachs (2006) argues that Muslim societies, particularly, Iran, Jordan, Morocco, and Tunisia, actually fostered female education in the 1980s and later. He argues further that increased schooling reduced fertility and led to economic growth. The details of those events merit closer analysis, as would similar analysis of the ethnoreligions and Hindu religion on the same score.

For the present purposes, the data seem to suggest that religion is a fruitful area for inquiry in enhancing our understanding of the substantial dispersion of female educational levels and the gender gap in human capital accumulation. Religion appears relevant in accounting for some patterns. Economic behavior does not take place in a vacuum. Context counts. For female education, religion is a big part of the context.

APPENDIX

TABLE A1
DATA SOURCES

Variable	Description	Source
No schooling	Proportion of the female population 15 years and older with no schooling	Robert Barro’s webpage
Educational attainment variables	Proportion of the female population 15 years and older for the measure of education	Robert Barro’s webpage
Urbanization	Proportion of the population living in urban areas in 1995	World Bank, World Development Indicators, 2001
Tropics	Proportion of land and water that is tropical in 1990	Global Data Manager, various years
Colonial Variables	Categorical variables for the respective former colonial rule.	Grier (1997, 1999), Munro (1996)
Young adult mortality	Percentage of the population not surviving to age 40 years in 1990	United Nations, Human Development Report (1997)
Percentage of women in the labor force	Female labor force a percentage of the total economically active population in 1990	World Bank, World Development Indicators (2006)

TABLE A2
DESCRIPTIVE STATISTICS: INDEPENDENT VARIABLES

Variable	Mean	Std. dev.	Minimum	Maximum	Country (max.)
Buddhist	0.036	0.143	0.000	0.855	Thailand
Ethnoreligions	0.055	0.111	0.000	0.523	Benin
Hindu	0.036	0.126	0.000	0.769	Nepal
Muslim	0.203	0.334	0.000	0.989	Tunisia
Nonreligious	0.034	0.057	0.000	0.423	China
Orthodox	0.024	0.130	0.000	0.931	Greece
Protestant	0.135	0.214	0.000	0.948	Sweden
Roman Catholic	0.347	0.370	0.000	0.972	Italy
Urbanization	0.548	0.238	0.060	1.000	Singapore
Tropics	0.488	0.475	0.000	1.000	Numerous
Mortality	0.145	0.122	0.022	0.521	Sierra Leone
Women in labor force	0.377	0.083	0.168	0.540	Mozambique

TABLE A3
DETERMINANTS OF FEMALE EDUCATIONAL ATTAINMENT: TWO-STAGE LEAST SQUARES

Variable	Regression coefficient/(t-statistic)			
	Unschoolcd	Primary	Secondary	Higher
Intercept	-2.560 (-1.27)	1.718 (0.93)	4.052 (2.36)	2.003 (1.09)
Buddhist	-0.538 (-0.57)	-0.274 (-0.42)	-1.178 (-1.46)	0.982 (0.97)
Ethnoreligions	1.176 (0.61)	-1.564 (-1.04)	-3.239 (-1.91)	-3.572 (-1.59)
Hindu	1.256 (1.61)	-1.093 (-1.18)	-1.551 (-1.97)	-1.020 (-0.84)
Muslim	1.572 (1.90)	-1.542* (-2.29)	-2.366** (-3.21)	-0.869 (-0.97)
Nonreligious	-3.213 (-0.69)	-2.973 (-0.86)	-4.087 (-1.03)	-2.869 (-0.77)
Orthodox	-0.159 (-0.19)	-0.090 (-0.15)	-1.404 (-1.89)	0.101 (0.13)
Protestant	-1.452 (-1.76)	-0.497 (-0.71)	-0.607 (-0.75)	0.258 (0.35)
Roman Catholic	-0.335 (-0.41)	0.151 (0.27)	-1.393 (-1.94)	0.174 (0.21)
British	-0.799** (-3.32)	0.247 (1.15)	0.531* (2.21)	0.124 (0.47)
No colony	-0.244 (-1.11)	0.353 (1.49)	0.423* (2.25)	-0.211 (-0.84)
Urban	-1.404* (-2.17)	-0.442 (-0.93)	0.907 (1.83)	1.925** (3.12)
Tropics	0.134 (0.45)	0.251 (1.29)	-0.080 (-0.37)	-3.358 (-1.16)
Mortality	0.772** (4.70)	-0.061 (-0.42)	-0.446** (-3.04)	-0.769** (-4.06)
Women L.F.	0.164 (0.31)	-0.496 (-1.14)	-1.030* (-2.20)	-1.015* (-2.56)
Adj. R ² /S.E.R	0.832/0.684	0.279/0.616	0.698/0.591	0.778/0.759

NOTE: *,** statistically significant at 5% and 1%, respectively.

TABLE A4
SAMPLE COUNTRIES

British colony	No Colony	All others
Australia	Austria	Algeria
Bangladesh	Bahrain	Argentina
Botswana	Belgium	Benin
Canada	Cameroon	Bolivia
Cyprus	China	Brazil
Egypt	Denmark	Central African Republic
Fiji	Finland	Chile
Gambia	France	Columbia
Ghana	Germany	Congo
Guyana	Greece	Costa Rica
India	Iceland	Dem. Republic of Congo
Jamaica	Iran	Dominican Republic
Kenya	Iraq	Ecuador
Lesotho	Ireland	El Salvador
Malawi	Israel	Guatemala
Malaysia	Italy	Haiti
Mauritius	Japan	Honduras
Myanmar	Jordan	Indonesia
New Zealand	Korea	Mali
Pakistan	Kuwait	Mexico
Sierra-Leone	Malta	Mozambique
Singapore	Nepal	Nicaragua
Sri Lanka	Netherlands	Niger
Swaziland	Norway	Panama
Trinidad & Tobago	Poland	Papua New Guinea
Uganda	Portugal	Paraguay
United States	Spain	Peru
Zambia	Sudan	Philippines
Zimbabwe	Sweden	Rwanda
	Switzerland	Senegal
	Syria	South Africa
	Thailand	Togo
	Turkey	Tunisia
	UK	Venezuela

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