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Women's Autonomy and Fertility:
A Comparison of Sociocultural Indicators

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Sociology

by

Rebecca Louise Álvarez

June 2011

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Dedication

I dedicate this volume to my father, Dr. Paul Giem. His support was always unconditional, and words cannot adequately express my gratitude.

ABSTRACT OF THE DISSERTATION

Women's Autonomy and Fertility: A Comparison of Sociocultural Indicators

by

Rebecca Louise Álvarez

Doctor of Philosophy, Graduate Program in Sociology
University of California, Riverside, June 2011
Dr. Christopher Chase-Dunn, Co-Chairperson
Dr. Augustine Kposowa, Co-Chairperson

This dissertation utilizes a feminist theoretical model of women's autonomy to explain much of the variability in national fertility rates from 1990-2006. While many previous efforts have been made to determine what causes variation in fertility, this research utilizes panel analysis to examine some cultural variables that have been largely ignored in the field, specifically Islam and the practices of polygyny and female genital mutilation (FGM). These variables are hypothesized to affect fertility rates positively. This research also re-examines previously studied economic, political, and educational indicators of female autonomy, in addition to economic development as measured by GNI per capita, using multivariate regression analysis to determine the strength of the effects of the cultural indicators of female autonomy on fertility change vis-à-vis these other variables. Results from the analysis suggest that a significant negative relationship exists between FGM and fertility change, and that a significant positive relationship exists between Islam and fertility change, but that significant relationships do not exist for any of the other variables examined and fertility. The neoclassical economic model of fertility change is not substantiated and arguments about women's autonomy and

fertility are somewhat supported. Implications for further research and public policy are discussed.

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Chapter 1: Introduction

Why is it necessary to conduct further research into the factors that affect fertility rates? The literature is already replete with multiple studies examining linkages between various different factors that affect fertility directly and indirectly. However, these studies primarily examine variables that are part of the “supply-demand model” of the fertility transition, in which fertility is viewed as a part of a cost-benefit equation. Variables that examine specific cultural practices which could affect fertility are still more or less taboo. Culture remains, as always, a hot-button topic. The purpose of this research is to determine empirically if the cultural status of women has an effect on the fertility transition independently of a nation’s level of development. Consequently, this research combines both some variables examined in previous research and some new variables addressing cultural factors in a single multivariate linear regression model to determine the overall effect of each variable on the fertility transition. In the next several chapters, I will show that these factors affect fertility rates in different ways and to different degrees than has previously been thought. The practice of female genital mutilation emerges as a particularly significant factor contributing to the delay of the fertility transition.

Consequences of population growth

The consequences of uncontrolled population growth for the world’s future hardly need debating. Since the publication of Malthus’ *Essay on the Principle of Population* in 1798, speculations about its implications have shaped public policy. Although such alarmist classics as *The Population Bomb* (Ehrlich, 1968) or *The Limits to Growth*

(Meadows et al., 1972) seem now somewhat dated, it is undeniable that the world's capacity to support the human population is being stretched, and that the projection by the Population Council for a world population of slightly over 9 billion by the year 2050 (Demeny and McNicoll, 2006) is unsustainable with current technology, consumption patterns, and natural resources. Evidence abounds along all ends of the scientific spectrum that population growth is straining the environment's capacity to support it. From soil depletion via intensified agriculture (Shapiro, 1995) to deforestation (Geores and Bilsborrow, 1991) to the availability of potable water (Falkenmark, 1990), studies show a direct linkage between population growth and shrinking resources (Harte, 2007). Given the further possibility Chase-Dunn hypothesizes in his iteration model (1997) that population growth creating environmental degradation eventually leads to violent conflict, reinforced by the multiple theorists who find that population growth without sufficient resources is a primary causal factor of both ethnic cleansing and genocide (Dobkowski and Walliman, 1998, Diamond, 2005), the imperative of reducing unlimited population growth becomes even more evident.

While there are an increasing number of critics of the "Western approach" to population issues who follow in the prodigious footsteps of Mahmood Mamdani (1973) in arguing that Western-style consumption patterns, not population growth, are the problem (Shrivastava, 1992; Kasun, 1999; Rahnema, 2002; Connelly, 2009), I feel that it is safe to say that both consumption rates and population growth are pressing issues in the attempt to preserve the planet. They are not contradictory; in fact, the effort to curb consumption in the developed world is just as necessary as the effort to promote the

fertility transition in the developing world. Along with the resource management advocated by neo-Malthusians (Pimental et al., 2006), it is therefore of the utmost significance to understand how the processes of population growth work. Since much of the population growth seen in the last hundred years is the result of decreases in infant mortality and increases in life expectancy, and certainly no one is advocating a reversal of these trends, the mechanism for controlling population growth must lie in reducing the birth rate.

The fertility transition

Reduction of the birth rate to replacement or below-replacement levels is the phenomenon described as the fertility transition or as Lloyd and Ivanov (1988) in Weeks (2005) term it, the shift from “family building by fate” to “family building by design.” The fertility transition is the driving portion of the larger demographic transition first identified by Kingsley Davis (1945) that has been empirically observed taking place in industrialized and industrializing nations around the world (Klasen and Launov, 2006), most notably in Europe and North America. The demographic transition began in developed nations in the late 18th century and spread to developing nations in the latter portion of the 20th century (Notestein, 1945; Davis, 1954, 1991; Coale 1973). The major prediction of demographic transition theory is that, as living standards rise and health conditions improve, first mortality rates decline, followed by a corrective decline in fertility rates. Demographic transition theory has evolved as a generalization of the typical sequence of events in what are now developed nations, where mortality rates

declined comparatively gradually beginning in the late 1700s and then more rapidly in the late 1800s and where, after a lag period of 75-100 years, fertility rates declined as well (Lutz and Qiang, 2002).

Most demographers predict that industrializing nations either are already making the fertility transition or will make it in the relatively near future, although there is significant dissent about how fast this shift will occur. Given the dire possibilities for the world population, there is intense policy interest in the variables that could affect fertility rates, perhaps most visible in the Millennium Development Goals outlined by the United Nations (2000). These goals—and others like them—implicitly recognize the importance of population control in addressing issues of extreme poverty, although the authors of the document did not insert explicit language about population growth—perhaps due to the poor track record of Westerners concerned about large birth rates among the poor and those of color.

The supply-demand model

The majority of explanations dealing with factors affecting fertility are part of what has been termed the “supply-demand framework” (Weeks, 2005), first proposed by Richard Easterlin (1975) and later championed by Paul Bongaarts (1992). Easterlin’s supply-demand hypothesis emerged as a reaction to the orthodox neoclassical economic ideas of Chicago School economist Gary Becker (Becker, 1960; Becker and Lewis, 1973), who saw children as commodities whose supply and demand fluctuated on the basis of their costs (in terms of time and money) and expected monetary benefits (termed

“direct utility”) to parents. Becker did not see parental preference as part of the picture; as a member of the Chicago School, sociological processes were heretical for him (Macunovich, 1998). While continuing the economic approach pioneered by Becker, Easterlin differed in his introduction of sociological variables such as “shifting preferences” (material aspirations) which also dictated fertility.

However, the fluctuating material aspirations that Easterlin hypothesized were ultimately linked to shifts in income and prices, making for an economics-centered model. The economist Joseph Schumpeter (1942) presaged Easterlin’s discussion of shifting family size preference in his famous work *Capitalism, Socialism, and Democracy*, in which he argued that in capitalist western society, parents increasingly were opting to limit family size because the costs of raising a large family in a capitalist society were greater than the benefits. Harvey (2010) attributes these rising costs to the expanding culture of consumption found in Western society. Both the Schumpeter and Easterlin explanations assume that something that resembles market “prices” exists within extra-market familial decisions, but these “prices” are determined by the social order and not by market exchange, indicating that shifts in culture, tradition, and the prevailing moral order are the distal causes of fertility change. This is a connection—unexamined by Easterlin—that forms the primary basis for the sociocultural explanations of fertility examined in the next section of this chapter.

Statistically, there is strong support for the Easterlin hypothesis as a major explanation for fertility change. Macunovich (1998) finds in a comprehensive analysis of forty-four empirical studies utilizing the Easterlin hypothesis to explain fertility that

the majority of the data support the classic hypothesis. Likewise, more recent studies (Abernathy and Penozza, 2002; Jeon and Shields, 2005) have found further support for the continued relevance of the Easterlin hypothesis. The popularity of the Easterlin hypothesis—based as much on its optimism for the fertility transition as its reliability—has given rise to an entire school of fertility researchers, many of whom have found employment at the United Nations Population Division or international nonprofit organizations such as the Population Council, and are thus enormously influential in the realm of policy formation. What I will tentatively call the “neo-supply/demand theorists” tend to focus on proximate factors—as opposed to distal factors—affecting fertility in a more nuanced updating of the economic fertility framework. Proximate factors are those that have a direct effect on fertility, such as contraceptive use or breastfeeding. Distal factors affect fertility through these proximate factors and are usually social-structural in nature. The neo-supply/demand theorists generally do not focus on these distal factors. Consequently, the supply/demand perspective possesses the benefit of allowing its adherents to sidestep uncomfortable and politically sensitive issues of culture.

John Bongaarts, one of the most prominent of those advocating modernization-oriented solutions to overpopulation, has focused on the effects of such proximate factors as malnutrition (Bongaarts, 1980), the availability of birth control methods (Bongaarts, 1991), the duration of breastfeeding (Jain and Bongaarts, 1981), and the availability of abortion (Tietze and Bongaarts, 1982) on fertility rates. Bongaarts’ research on proximate factors has culminated in a widely accepted model incorporating the major proximate factors into an equation for predicting fertility. The equation is

$$\text{TFR} = \text{TF} \times \text{Cm} \times \text{Cc} \times \text{Ci} \times \text{Ca} \times \text{Cp}$$

where TFR = the total fertility rate, TF = the fertility rate one would expect in the absence of the proximate determinants, Cm = the index of women of reproductive age who are not married, Cc = the index of women who use contraceptive methods, Ci = the index of women who are experiencing post-partum infecundability, Ca = the index of pregnancies that are terminated by abortion, and Cp = the index of women who are sterile.

The generally accepted model of fertility embraced by neo-supply/demand theorists can be best illustrated by the model shown in Figure 1, proposed by Bongaarts (1993):

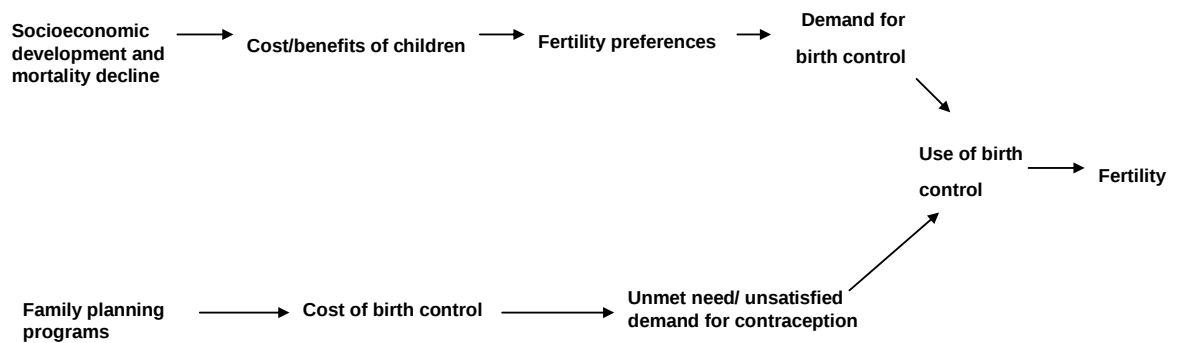


Figure 1: Analytic framework for the determinants of fertility

The socio-cultural model

There is considerably less cohesiveness amongst the theorists arguing from the other major perspective explaining fertility change: that which I will term the “socio-

cultural model.” While those theorists examining socio-cultural variables as opposed to economic variables do see the importance of proximate factors, their focus usually centers on distal factors. Although not always explicitly feminist in approach, very commonly, some variant of women’s autonomy is examined, whether political, educational, or economic. This approach is both anthropological and sociological in nature, and probes the root social causes of the shifting preferences in family size noted by Easterlin and Schumpeter. Given the sensitivity of distal cultural factors affecting fertility, along with the legacy of eugenics in population research (see Ramsden, 2002 for a discussion of the connection between demography and eugenics), it is perhaps to be expected that those aligned with the socio-cultural model are not easily identifiable as such. It is possible, however, to see the impact of the socio-cultural model at the public-policy level, particularly in the United Nations. Since 2000, when the Millennium Development Goals were unveiled, a direct effort to aid women’s autonomy has been an explicit part of UN policy at all levels, even extending to a direct distribution of aid to women over men in some instances (United Nations Development Program, 2010).

Goal of this research

This dissertation advances an argument about how fertility rates change at the national level using a feminist socio-cultural model that utilizes some variables that have been largely ignored in previous research on fertility, specifically the presence of polygyny, Islam, and female genital mutilation. This argument stands in contrast to traditional economic supply-demand models of population change. Although many of studies of fertility examine fertility patterns within countries, this research does so at the

cross-national level, as variables in the theoretical model are also present at the cross-national level. The next chapter is a review of the relevant literature on supply/demand factors affecting fertility rates and the literature on socio-cultural factors and fertility.

Chapter 2: Literature on Supply-Demand and Sociocultural Variables Affecting Fertility

Supply-Demand Explanations of Fertility

Within the literature on economic explanations for fertility change, there exist three main theoretical models of fertility. In chronological order of their appearance, they are: 1) Easterlin's relative income hypothesis (1973; 1980); (2) the New Home Economics theory of Willis (1973) and Becker (1981); and (3) the asset theory of children advanced by Cigno (1992) and Cigno and Rosati (1996). While the Easterlin hypothesis has been briefly outlined previously, it is re-evaluated again here with regard to its empirical support within the literature, along with the statistical support for the later two models.

The Easterlin Hypothesis

The relative income model emphasizes the role of male incomes, relative to economic aspirations, as the driving force behind both fertility and female labor force participation (Easterlin, 1973; 1980). Aspirations for goods by young adults are formed in late adolescence by the economic conditions that are experienced by young adults in their parents' household as they are growing up (Easterlin, 1973). A low level of relative income, either from high economic aspirations or due to low current incomes of young adults, causes compensating behavior by young people to raise their economic status to be congruent with their aspirations. According to Easterlin, this behavior includes a reduction in fertility. In what has become known as the “full Easterlin model,” relative income is determined by the size of the young adult cohort relative to that of older adults, both measured contemporaneously (Easterlin 1980). A particularly large cohort of young adults faces within-cohort competition for education and employment opportunities, which in turn, drives down their earnings. In contrast, the earnings of their parents—if

the parents have been born to a smaller cohort, may have been particularly high, contributing to the formation of unrealistically high material aspirations by the younger generation. Therefore, relative cohort size influences both incomes and economic aspirations of each generation as they make decisions about fertility and employment as young adults.

The two primary surveys of empirical tests of the Easterlin model have been conducted by Pampel and Peters (1995) and Macunovich (1998). Although Macunovich concludes in her review that the statistical evidence is generally supportive of the Easterlin hypothesis, Pampel and Peters find that the empirical evidence is "mixed at best and plain wrong at worst ..." (p. 189). Although supportive of the general framework of the Easterlin model, Macunovich cautions that relative income should not be taken as the sole determinant of fertility and suggests controlling for women's wages in testing the hypothesis. Alternatively, she recommends an integration of both the relative income and New Home Economics models (as per Macunovich, 1996).

Montgomery and Trussel (1986) incorporate economic aspirations into an individual utility function, demonstrating that the relative income model fits within the neoclassical paradigm of the New Home Economics model, to be discussed next. Male income appears as an argument in the fertility and female labor supply equations in empirical tests of both theories. However, this variable appears as relative income in models from the Easterlin tradition (e.g., Macunovich 1996a), but as absolute income in formulations of the New Home Economics models (e.g., Butz and Ward 1979). Although Easterlin emphasizes relative income as the primary variable driving trends in fertility

and other social behavior, Montgomery and Trussel show that price effects are consistent with this perspective. Macunovich (1966a) integrates the two approaches in an empirical model that includes both relative male income and women's wages as determinants of fertility and female labor supply.

The New Home Economics School

One of the major alternative explanations of fertility movements comes from the model of household decision-making which forms the core of what Ermich (1979) termed the 'new home economics' approach, referring to the model by Willis (1973) and its statistical application by Butz and Ward (1979). This model postulates that fertility responses to changes in men's earnings and women's wages are different in families with and without employed wives, and that the probability that a married woman of childbearing age will enter paid employment is a function both of her husband's earnings and of her own earning capacity. In particular, the opportunity costs of time spent on bearing and raising children rise for working wives as women's wages increase. Willis hypothesizes that for any given level of men's incomes, this increase in wives' wages induces couples to have fewer children and also to space them more closely. The opportunity cost of time of women not in employment is not affected by an increase in women's wages; however, expanding earning capacity induces a greater proportion of women of childbearing age to enter employment, thus increasing the proportion of families whose fertility is negatively affected by rising women's wages and enhancing their negative impact upon aggregate fertility. The potential earnings of women have generally increased—particularly in developed nations—while the educational level of

women has risen, in addition to the general global rise in real wages. Structural changes in the industrial and occupational structure have also combined with a slow rate of growth in the male labor force, the wage differential between men and women, and changes in social attitudes toward women working outside the home, to expand employment opportunities for women, especially when including part-time employment in the reckoning. Given the socially prescribed division of labor within the family in virtually all nations, this increase in the earning capacities of women has had an increasingly greater negative impact upon aggregate fertility.

The Asset Theory of Children

A third economic theory of fertility sees children as investment goods in an intergenerational transfer model. Cigno (1992) and Cigno and Rosati (1996) present models that emphasize intertemporal resource allocation, in which middle-aged income earners make transfers to the nonworking young and older generations. Operating from a utilitarian standpoint and assuming purely self-interested behavior, in these models income earners make transfers to their retired parents as repayment for loans that were made to them as children. Since this model assumes the pattern will hold across generations, a primary incentive for parents to have children is to assure a future flow of transfers to them upon retirement. If on the one hand, a family's return on loans to children exceeds current market rates of return, then families will utilize this transfer mechanism despite the availability of alternative forms of investment. Alternatively, other families with a rate of return on intergenerational transfers that is less than the prevailing market rate will abandon the family transfer system, and the incentive to

produce children lessens. As a result, changes in the proportion of families using market as opposed to private transfers—for example, due to changes in market interest rates—consequently have led to variations in aggregate fertility rates. A similar theoretical argument states that increases in women's wages have negative effects on fertility and increases in men's wage rates have positive effects on fertility. Although their theoretical underpinnings are different, the children-as-assets model and the theory of New Home Economics predict the same effects of wage rates on fertility.

All of the above-discussed studies share a similar methodological hurdle; a principle analytical challenge when modeling fertility relations with aggregate data is the endogeneity of the variables present in these models. The total fertility rate, women's participation in the labor force, women's education, and women's earnings are joint outcomes of interdependent decisions made by men and women when young adults. In addition, male incomes may also be affected by female wages and labor force participation, a phenomenon which reflects a possible replacement of male workers by female workers in labor markets. Even male relative cohort size is a variable that may be endogenous at the aggregate level if the international immigration of young men is responsive to economic conditions that are correlated with wage rates and labor force participation (Macunovich 1999). If, then, none of the important independent variables in fertility models can be assumed to be exogenous, the identification and estimation of structural models of fertility with traditional regression analysis becomes problematic. Exogeneity assumptions are characteristic of many aggregate time-series studies of fertility. Female wages are treated as exogenous, for example, in Butz and Ward (1979),

Ermisch (1979), Shapiro (1988), Lee and Gan (1989), and Winegarden (1984), often in interaction terms with other variables. However, wage rates also are dependent upon work experience and education, which are in turn interdependent with the decision to have children. In a review of economic models of fertility, Macunovich (1996b) argues that the endogeneity of female wages makes any causal interpretation of estimated wage effects on fertility spurious. Wang et al. (1994) and Cigno and Rosati (1996), to circumvent this issue, use vector autoregressions in their research that allow for the modeling of all variables as potentially endogenous.

Wang et al. (1994) use a multivariate model involving fertility labor force participation, and consumption, all expressed as rates of growth. However, this transformation of variables discards information on the long run relations among the variables, which is of most relevance to the underlying theory. Cigno and Rosati (1996), on the other hand, retain the original nonstationary form of the variables, employing cointegration methods to analyze the long run relations among fertility, male and female wages, and social security coverage. Their tests of the investment model of fertility using data from the U.K., Italy, and West Germany find evidence of cointegrating relations among the variables that are consistent with the predictions of the underlying theory (McKinnon and Rajbhandary, 2003).

Most demographers consider it an unresolved debate whether economic models of fertility accurately explain the trends and fluctuations in birth rates that have been observed in the mid-to-late twentieth century and that persist today in the twenty-first. Commenting on both relative income and opportunity cost models of fertility, Olsen (1994) contends that "neither theory has particularly good out-of-sample predictive ability in terms of the relation between fertility and the business cycle ..." while Smith (1981) argues that the decline in fertility rates during the 1960s is evidence that counters

the relative income hypothesis, given that that era experienced a steady economic boom. Macunovich (1998), in the most comprehensive survey of the relative income hypothesis, contends that her review of twenty-two empirical tests of the relative income hypothesis with aggregate North American data finds supporting evidence in the majority of these studies. On the other hand, in her re-examination of the widely cited Butz and Ward (1979) finding of countercyclical fertility, Macunovich (1995) concludes that this model fails to match the empirical reality in United States fertility patterns after 1954. No such comprehensive reviews of the statistical research currently exist for any of these models on a global comparative level.

Literature on Sociocultural Variables Affecting Fertility

According to the report of the National Research Council (2000), "In the light of evidence assembled over recent years, components of classical demand theory are now subject to debate. Perhaps the biggest surprise has been the evidence that structural modernization of national economies, while conducive to fertility decline, is not a necessary precondition" (p. 59). This report reflects the changing of the theoretical paradigm within demographic research toward a more sociological and less economic approach to fertility change. The body of research attributing the fertility transition to changing social norms and new cultural arrangements is broad. A few major strands can be identified, however. Firstly, there is a line of argument that religion has affected the

fertility transition. Secondly, there is a more extensive school of thought exemplified by Mason (1987) that attributes the fertility transition to different types of women's autonomy; in particular, women's education, labor force participation, and political participation. Thirdly, there are also a few studies that examine other cultural variables that may affect fertility, such as polygyny, FGM, son preference, and male fertility preferences. In this section I review and discuss the literature around these different explanations.

Religion and Fertility Decline

Since the time of Malthus, various social theorists have identified religion as a factor influencing fertility—usually with a finger pointed at a specific “offending” religion. Today, demographic arguments about fertility and religion are of two stripes: the one the old argument that the *type* of religion influences fertility, and the other an argument that the *intensity of religiosity* itself is the causal factor. Most studies focusing on religion type and its effect on fertility have focused on Catholicism, Mormonism, or more recently, Islam. More limited in scope have been studies examining the connection between Judaism and fertility. These religions have a common factor: they are all “religions of the book.” The doctrines of these salvation religions often forbid contraceptive use and/or promote fertility explicitly. Little or no research exists that examines Hinduism, Buddhism, or animistic religions with respect to fertility patterns.

Westoff and Jones (1979) have documented the decline of Catholic fertility in the United States, while Cutright et al. (1976) point out the high fertility rates in Latin

America as evidence that Catholicism influences fertility. Others (Berman et al., 2007) have argued that declining European fertility rates can be partially attributed to declining religiosity among Catholics. Looking within the United States, Thornton (1979) found that Mormons have a significantly higher TFR, even when controlling for variables including region, education levels, and occupation. Building on this finding, other scholars (Bean and Mineau, 1983; Thomas, 1983) have attributed the higher fertility levels directly to the pronatalist and anti-contraceptive views of the Mormon church, a finding which other theorists have extrapolated to other faiths with similar views on fecundity and contraception, most notably Catholicism and Islam.

Some research (Caldwell, 2001; United Nations, 2003) finds that countries with a predominantly Muslim population are more likely to have high fertility rates, apparently supporting the idea that Muslim women have less control over their fertility. Despite these findings, there exist nations which are strongly Islamic and yet have made the fertility transition. The oft-cited example of Indonesia, which has the largest Muslim population in the world, is a case in point. From 1975 to 2005, Indonesia reduced its total fertility rate from 5 children per woman to 2 children per woman (World Development Indicators). Although it can be argued that Indonesia embraces a more secular form of Islam and practices a separation of church and state, there is also the example of Iran, which reduced its fertility from 5.6 children per woman to 3.3 children per woman in the time period from 1986 to 1995; this, after the Islamic revolution and under a theocratic leadership governing under Shari'a law. As Hoodfar and Assadpour (2000) explain, in the immediate postrevolutionary period, religious leaders condemned family planning,

which was portrayed as part of a Western strategy to reduce the size and influence of the Muslim population. Their teachings contrasted with the generally positive view of family planning that had been promoted under the Shah.

However, those religious leaders who now also held new positions of political leadership were soon faced with the need to solve many problems that were aggravated by the rapid growth of Iran's population... The vast network of mosques, which extended to even the most remote villages, was employed to spread the details of the officially sponsored population program. Local religious leaders were especially effective in presenting the message in a way that would be acceptable to poorer, less-educated Iranians who might have resisted the advice had it been offered by government officials. Thus, in spite of an environment that still involves substantial restrictions on the social roles open to women, restrictions that are at least partially religiously based, religious leaders have made a substantial contribution to Iran's rapid decline in fertility, which saw the total fertility rate fall from 5.6 in 1986 to 3.3 in 1995. (Hoodfar and Assadpour 2000: 32).

Further evidence that suggests that Islam in itself is not a cause of high fertility is found by scholars examining differences within nations (Jejeebhoy and Sathar, 2001; Morgan et al., 2002). They find no evidence that Muslim women have less independence than women of other religious groups in the same societies.

Goldscheider, in his classic analysis (1971), identified two theoretical approaches to empirical findings suggesting a relationship between fertility and religion. The first, which he labeled the “characteristics approach,” argues that arguments about religion’s effect on fertility are often spurious. That is, religion’s purported effects had more to do with socioeconomic status, geographic location, and education levels, and by controlling for these variables, the effect would disappear. The other approach, which he called the “particularized theology” approach, held that some specific religious teaching governing birth control led to higher fertility rates. Goldscheider himself offered a different

explanation. In his classic book and in his later work (Goldscheider and Mosher 1991; Goldscheider 1999), he suggested that two alternative lines of inquiry were likely to be more helpful in understanding religion's role in influencing demographic trends.

In *Population, Modernization, and Social Structure*, Goldscheider urged demographers to expand their view of religion beyond specific teachings related to fertility control and to include "the total content of that social organization, of which the particular theology is but one part and often not the most significant" (1971: 274). In his following empirical work, which examined the fertility patterns of religious groups in Israel, Goldscheider has directed attention to what he terms "broadly based norms of family control and gender relationships"(1999: 312). This key pairing of gender relationships and religious belief seems to be the consensus among scholars of religion and fertility today (McQuillan, 2004; Hayford and Morgan, 2008), who are gradually coming around to the gender approach embraced by those who look at aspects of women's autonomy.

Women's Education

The body of research that asserts some women's autonomy as the primary driver of fertility has its roots in Boserup's (1989) work examining population and women's status in society. The most commonly promoted explanation involves women's education levels. A great many studies (Cochrane, 1979; Caldwell, 1982; United Nations, 1987 and 1995; Cleland and Rodriguez, 1988; Adamchack and Ntseane, 1992; Castro Martín, 1995; Ainsworth et al, 1996; Jeffery and Basu, 1996; Al-Ryami et al., 2004) have found that women's education has a negative effect on fertility. However,

there is disagreement as to both the strength and the nature of that relationship. For instance, Jejeebhoy (1995) finds that at least a secondary level of education is necessary in order to negatively affect fertility when controlling for other socioeconomic factors. The question as to the causal mechanism remains murky; is it that educated women remain longer in school, thus putting off marriage and childbirth? That they are able to exercise veto power within the family unit over the number and timing of births? Or does education somehow reduce women's family size preference?

A simple causal relationship between higher education levels and lower fertility levels is not universally supported (Bledsoe et al., 1999). Critiques of the education-fertility direct relationship also include Cleland and Kaufmann (1998), who argue that while education and child mortality are clearly and consistently related to each other, there is significantly more variation with the education-fertility relationship, which they view as context-specific. Recent research by Bongaarts has included an analysis of the role of education in forming fertility preferences (Bongaarts, 2003). He finds that the effects of women's education vary widely depending on the stage of the fertility transition. This is congruent with the Cleland and Kaufmann argument about the contextual nature of the education-fertility relationship. Furthermore, Morsund and Kravdal (2003) find that education levels of women in the community at large have more impact on fertility than does a woman's own education level. This is what one would expect to find in a situation where women's fertility is also dependent on broader cultural factors. Morsund and Kravdal attribute their finding of the reduced importance of women's education levels to the increased importance of son preference.

One problem with relying too heavily on women's education as a primary explanation for fertility change is that it assumes that women will be allowed to practice the autonomy bestowed by education. Basu (1992) notes that within India, although northern Indian women may possess higher levels of education, southern Indian women are in fact more autonomous and therefore able to exercise greater influence in the fertility decision-making process. A further complication exists in the issue of how "education" is defined; does a religious education, for example, have the same fertility-dampening effect as a science-based Western education?

Women's Participation in the Labor Force

An early argument about women's economic autonomy was that increased female labor force participation led to decreased fertility, as women delayed childbearing or reduced their family size preferences in order to work. This was supported by empirical research (Weller (1977; Lehrer and Nerlove 1986; Brewster and Rindfuss 2000). Weller (1977: 43) lists four possible explanations for this negative association:

1. women's fertility affects their labor force participation;
2. women's labor force participation affects their fertility;
3. women's fertility and their labor force participation affect each other;
4. the observed negative relationship is spurious and caused by common antecedents of both variables.

The general consensus among researchers was that women's labor force participation both affected and was affected by their fertility, for the same reasons that

education was theorized to affect fertility. However, the theoretical tide has started to turn, as more and more studies have found that the cross-country correlation coefficient for female labor force participation and fertility changed from negative to positive around the 1980s (Esping-Andersen 1999; Brewster and Rindfuss 2000; Ahn and Mira 2002). This means that the countries that now have the lowest levels of fertility are those with relatively low rates of women's employment, and the countries with higher fertility levels tend to have relatively high rates of women's employment. Using vector-error correction models, Engelhardt et al. (2004) theorize that this is due to the increased social support for working mothers in the forms of cheaper and sometimes state-subsidized childcare as well as the increased availability of part-time work. More research in this area is needed; a major weakness of the existing body of research outlined above is that it only includes data from more-developed Western nations. Little research has been completed examining the connection between women's employment and fertility in less-developed nations; that which does exist has been primarily theoretical (see Oppenheim Mason, 1987). The sparse body of quantitative research that does exist is limited to individual national case studies, viz., Oman (Al Riyami et al., 2004) and Zaire (Shapiro and Tambashe, 1994), although other research conducted in developing countries has examined connections between women's employment and gender roles, contraceptive use, or use of abortion.

Polygyny

As Sub-Saharan Africa has a high incidence of polygyny as well as the highest fertility rates in the world, it is worthwhile questioning the relationship between the two. It is also worth noting that polygyny often results in high brideprices to effectively “ration” women, while dowry systems often emerge in the absence of polygyny. While some researchers have viewed the connection between fertility and polygyny in terms of the brideprice system that usually goes with it (Becker, 1974; Grossbard, 1978), it is more direct to look at the presumed maximization of fertility that occurs when virtually all women in a society have the opportunity to bear children. Bergstrom (1994) proposes an economic model in which polygyny is a solution for males looking to produce the maximum amount of offspring. Bankole and Singh (1998) find supporting evidence for this idea in their study of multiple countries with high fertility rates. Interestingly, they find that the higher is the incidence of polygyny, the larger is the average gap between husbands’ and wives’ preferred family size, a finding which I will revisit later in the theoretical model.

At least one researcher has used the cumulative findings of the above-mentioned studies along with her own research to argue for the social abolition of polygyny. Using a quantitative model of polygyny and fertility, the economist Michelle Tertilt (2005) claims that enforcing monogamy lowers fertility, shrinks the spousal age gap, and reverses the direction of marriage payments. Her model finds that banning polygyny decreases fertility by 40 percent for reasonable parameter values.

Female Genital Mutilation

Demographic literature focusing on female genital mutilation (FGM) has primarily focused on women's reproductive health. Studies find that women who have been circumcised have significantly higher risks of self-reported perineal tears (Larsen and Okonofua 2002), fetal distress (Vangen 2002), and general difficulties (Jones et al 1999). But the literature around issues of fertility is sparse, and the results of these studies are mixed. Larsen and Yan (2000) conducted a study of women from 3 countries with mixed rates of FGM prevalence (Central African Republic, Côte d'Ivoire, and Tanzania). They found in two countries (Côte d'Ivoire and Tanzania) that women who were circumcised had higher total rates of fertility than their compatriots who were not circumcised. However, they found the reverse to be true in the Central African Republic.

Son Preference

The preference for sons over daughters is another cultural factor hypothesized to affect fertility. If parents desire one or more sons, then they may have larger families than would otherwise be the case, and this may be "a significant barrier to further fertility decline" in many countries (Rahman and DaVanzo 1993). This view is not undisputed however, (De Silva 1993), and as evidence one may reference the finding that in Malaysia, Chinese parents have stronger son preference but also fewer children than Malay parents (Pong 1984). Another complication exists in the methodology of this research. There are a number of techniques for measuring the presence and strength of son preference. The simplest is to ask parents whether they prefer sons. The difficulty though, is that a stated attitude of son preference is no guarantee that intentions will

actually affect fertility behavior (De Tray 1980). Mannan (1988) states that "many researchers have begun to question the predictive value of statements regarding future childbearing and question whether such responses have any meaning at all"(p. 37). Perhaps a better test for the presence of son preference requires identifying the effects on behavior—what Rahman and DaVanzo (1993) call "manifested son preference". This is not easy, and may not even be possible (McClelland 1979), but attempts to discern the results of behavior which might reflect son preference continue nonetheless. Typically, the preferred method for observing this variable has been hazard model analysis. With the use of hazard models, son preference has been observed in China (Li and Cooney 1994; Tu 1991), Vietnam (Haughton and Haughton 1995; 1998), Bangladesh (Rahman and DaVanzo 1993) and among Chinese-Malaysians (Leung 1988; Pong 1994). On the other hand, no evidence for a connection between son preference and fertility has emerged from similar models applied to Thailand, the Philippines or Indonesia (Trussell et al. 1985). More recently, the Demographic and Health Surveys (DHS) have enabled researchers to correlate the number of sons a woman has with the desire to have more children. Utilizing the data from these surveys for Nepal, India, and Bangladesh, Jayaraman et al. (2008) find that the number of existing sons inversely affects women's desire for family expansion.

Chapter 3: Theoretical Model

This research advances a liberal feminist model of fertility growth and decline that rests on women's autonomy, in contrast to traditional demographic models of birthrate decline which posit that modernization reduces a country's birthrate by decreasing the demand for children and decreasing the costs of fertility regulation. In such modernization-centric models, which reflect a neoclassical economic view of fertility, family planning is an integral part of fertility regulation, and lack of use of contraception is not-so-subtly viewed as a woman's fault:

Unmet need is essentially a conflict between what a woman wants and what she does about it: She wants lower fertility but *fails to do what is needed to prevent pregnancy* (Bulatao, 1998). (My italics)

Fertility is frequently portrayed as affected only by the factors that modernize a country; power relations between women and men are seldom—if ever—discussed.

Such economics-centered models are seemingly oblivious to the fact that men, on average, prefer a much higher number of children than do women, as established by a number of researchers (Donovan, 1995; Ezeh et al., 1996; Stash, 1996). Statistical support also exists for the primacy of men's preferences within the family dyad in many countries; for example, De Rose and Ezeh (2005) find in their study of fertility patterns in Ghana that men's education and attitudes toward family size ultimately matter far more than do women's preferences or education levels. Further, even within developed countries, married men are significantly more likely both to want more children in their family than they already have, and to prefer more children than their spouses (Johns Hopkins School of Public Health, 2003). This has to do with a number of factors, such as the lack of responsibility for the care of infants that men bear in almost all countries in

both the global North and global South, the patriarchal construction of virility and power through fatherhood, and the biological reality that men do not have to undergo the painful and potentially dangerous experience of pregnancy and childbirth. Some evolutionary psychologists (Buss, 1994; Kenrick and Keefe, 1992) also argue that there is a sociobiological tendency for men to maximize genetic dispersion through multiple children, while women are motivated to provide maximum care and benefit to a smaller number of children, thus enhancing their chances of survival. Whether the root cause is cultural or biological I will leave for other researchers to debate; however, the empirical reality is that men are motivated to have more children than are women.

As women on average prefer to have less children than do men, I theorize that when women have more autonomy, they also opt to have fewer children, thus decreasing the fertility rate. This model builds upon Mason's (1987) hypothesized models of fertility as affected by women's autonomy as shown below in Figure 2:

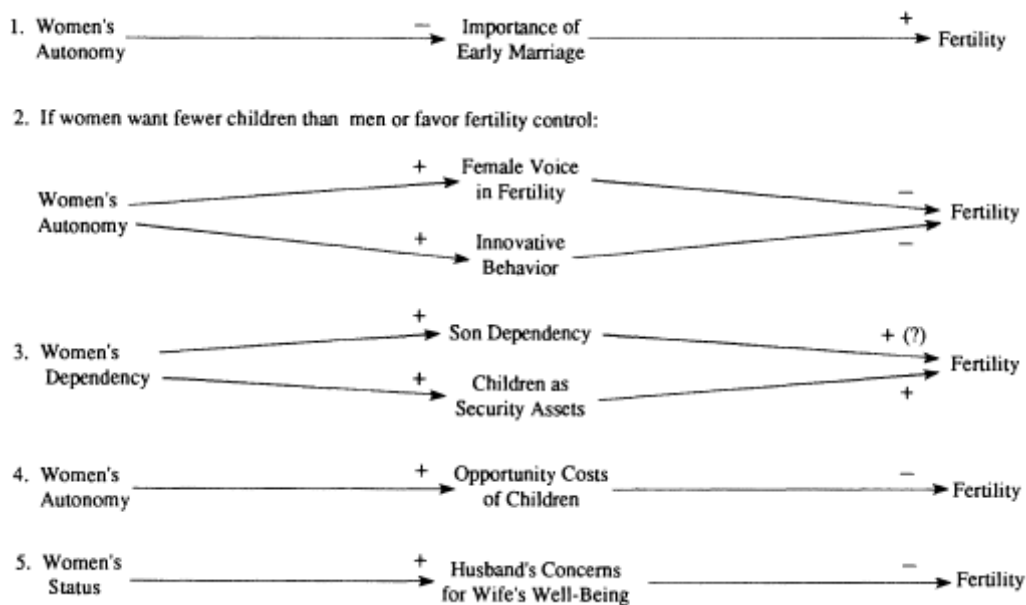


Figure 2: Mason's (1987) hypothesized models of women's autonomy and fertility

Women's autonomy can be measured in several ways; some of these have previously been studied. Using Jeejeebhoy's (1995) typology of women's autonomy as a model, I propose a typology of women's autonomy as follows:

Economic autonomy—the degree to which women are successfully integrated into the workplace and are financially independent relative to men.

Political autonomy—the degree to which women exercise political power through political movements or suffrage, and are able to attain political positions relative to men.

Educational autonomy—the degree to which women are able to complete their education relative to men.

Cultural autonomy—the degree to which women are seen as the cultural equals of men i.e., the degree of social acceptance of women's independence from men.

This last type of autonomy will be the primary focus of this research; it has often been neglected by researchers of fertility patterns. Despite its neglect by scholars, cultural autonomy is also a cause of change in the other three types of autonomy, and thus may well be the most significant in terms of its impact on fertility. This dissertation examines several variables which indicate the degree of women's autonomy and independence from men and the effects of these indicators on national fertility rates over a 16-year time period (from 1990-2006).

Women's Economic Autonomy

Women's representation in the paid workforce has long been recognized in the literature as an important distal factor. Kingsley Davis (1984) attributed the majority of fertility decline in Western countries to the rise of women in the workplace and the decline of traditional gender norms that dictated a male breadwinner role. It is also possible, though, that the type of work that is available to many women in non-Western countries (for example, agricultural work or factory labor for transnational corporations) does not economically empower women enough to significantly affect fertility. Given the greater number of children desired by men, and the dependent position in which many women are placed in the relationship dyad, many—indeed, I would argue, most—women are not able to effectively control the number of children that they bear. If women do not work (particularly in higher-income occupations where they may receive as much income as their male partners), then they are effectively trapped in a dependent position. Cultural factors create an environment in which it is socially unacceptable to be an autonomous woman, so women remain in a relatively powerless position vis-à-vis men, and have less control over their fertility.

Women's Political Autonomy

Regan and Paskeviciute (2003) examine the extent to which fertility rates directly and indirectly - through women's employment and political office - are associated with the use of force by a state. They draw on public opinion literature, which shows that women's attitudes toward the use of force differ from those of men, to argue that the more women have access to the political process the more constrained will be the state in its use of

force. The results of their analysis suggest that policies to promote family planning could be one effective form of managing the amount of interstate violence. However, no recent studies examine the degree to which women's political participation affects a nation's fertility rate. It is possible that female political participation, particularly in the holding of public office, may affect a nation's birthrate through a similar mechanism, as female politicians may support family planning measures and birth control more vigorously than do their male counterparts. States that do not represent women in positions of government furthermore reinforce the cultural effects of patriarchy, as the attitude that governmental authority promotes then encourages a societal view of women as less valuable and therefore possessing fewer rights than do men. It is therefore important to examine the representation of women in higher positions of government power as an indicator of women's political autonomy.

Women's Educational Autonomy

As discussed in Chapter 1, the connection between women's education and fertility is an important one. My model, however, argues that cultural measures of women's autonomy are more important in determining fertility overall than education in women. Akin (2005) finds support for this argument in his panel study of 14 Middle Eastern countries for the period between 1980 and 1998. Using a pooled cross-sectional time series GLS model, his results indicate that tertiary education among women is negatively correlated with fertility but not significantly so. Further, Monstad et al. (2008) find that increasing education leads to postponement of first births away from teenage motherhood and

towards women having their first birth in their twenties as well as (for a smaller group) up to the age of 35-40. They found no evidence, however, that more education results in more women remaining childless or having fewer children. While the model outlined in this chapter does see educational autonomy for women as an important factor in reducing fertility, it theorizes that cultural factors are more important overall, as cultural factors determine not only what type of education women receive (perhaps the education in question may be based upon promoting roles as wives and mothers—think home economics courses), but also whether women are allowed to practice their autonomy with regard to their fertility. In sum, the model sees women's education as an important factor contributing to fertility change, but by no means the most important variable.

Indicators of Women's Cultural Autonomy

Some types of religions also pose a problem for women's autonomy and control of their fertility; many religions forbid contraception, and many more view abortion as a form of murder. Even more religions actively propagate the submission of women to men as part of the divine order. It is important to note, however, that a great deal of variation exists within and between religions in terms of how religious principles are adhered to and/or enforced. Governments which operate on a theocratic basis are more likely to enforce such religious principles as submission to one's husband or the prohibition of contraception. Those governments that operate within a theocratic

framework are overwhelmingly likely to be Islamic, although certainly not all Islamic countries operate under Shari'a law. Therefore, I include Islam as an indicator of women's cultural autonomy in the theoretical model to test the idea that Islamic dominance in society reinforces a culture in which women bear more children.

The practice of polygyny contributes to a lack of autonomy for women by promoting a social dynamic wherein social status for men is measured by the amount of wives that can be accumulated and the number of children that can be supported. Such a dynamic puts greater pressure on women to bear children in order to achieve high social status, as wives must essentially compete with one another for distinction in the family unit and larger social group. It should be noted that polygyny is a difficult concept to define and measure. While formal polygyny (as defined by the legal acceptance of multiple wives in a marriage) is relatively localized to Africa and Southwest Asia, informal polygyny (in which there is a primary legal wife and multiple girlfriends or "mistresses") is widespread across the globe. This research will focus on formal polygyny, as the legality of polygyny is indicative of a broader social acceptance of the practice, and data are unavailable for the practice of informal polygyny. Empirically, the regions of the world with the highest total fertility rates, Sub-Saharan and North Africa, are also the geographic areas where polygyny is practiced with the greatest frequency at the formal level.

The practice of female genital mutilation (henceforth referred to as FGM)—is defined by the World Health Organization (WHO) as the partial or total removal of

external female genitalia and injury to the female organs for cultural or other non-therapeutic reasons (WHO, 1995). FGM has four major forms, as defined by the WHO:

- 1) Clitoridectomy: partial or total removal of the clitoris and, in rare cases, only the prepuce.
- 2) Excision: partial or total removal of the clitoris and the labia minora, with or without excision of the labia majora.
- 3) Infibulation: narrowing of the vaginal opening through the creation of a covering seal. The seal is formed by cutting and repositioning the inner, or outer, labia, with or without removal of the clitoris.
- 4) Other: all other harmful procedures to the female genitalia for non-medical purposes, e.g. pricking, piercing, incising, scraping and cauterizing the genital area.

FGM represents perhaps the most extreme form of control over a woman's body, effectively ending her sexual autonomy. In fact, cultural apologists for the practice defend it precisely on the grounds that a woman not circumcised will be impossible to control sexually. This argument exposes the true purpose of the custom; which is of course to decrease the likelihood of women's sexual independence.

Historically, FGM has been practiced for a long time and in many different areas of the world, including by the Phoenicians, Hittites, and Egyptians (Sakeah et. al, 2006). In the Victorian era and even up until the 1950s in the United States and England, FGM was used as a "treatment" for hysteria, lesbianism, masturbation, and other behaviors termed "women's ailments." Today, the regions in which this cultural practice is most

widespread are Sub-Saharan and North Africa (with 26 countries on the African continent reporting some variation of FGM occurring with frequency in the population).

Increasingly, the practice has spread to Western countries along with the immigrant communities that are unwilling to give up this custom. Worldwide, it is estimated that 130 million girls and women living around the world today have been mutilated in this manner, and another 2 million are at risk of being subjected to the procedure every year (WHO, 2010). Immediate complications of FGM include severe pain, shock, hemorrhage, tetanus, sepsis, urine retention, open sores in the genital region, and injury to nearby genital tissue. Long-term consequences can include recurrent bladder and urinary tract infections, cysts, an increased risk of childbirth complications and newborn deaths, or the need for later surgeries. For example, the FGM procedure that seals or narrows a vaginal opening (type 3) needs to be cut open later to allow for sexual intercourse and childbirth. Sometimes it is stitched again several times, including after childbirth; hence the woman goes through repeated opening and closing procedures, further increasing and repeating both immediate and long-term risks. Psychological consequences of the procedure can include anxiety, depression, chronic irritability, frigidity, and marital conflict (Dorkenoo, 1996).

Some apologists for the practice, prominent among them Sierra Leonean academic Fuambai Ahmadu, argue that men are often not involved in the decision to circumcise girls, and that circumcision is considered “women’s business”. Indeed, FGM is so much a part of Sierra Leonean culture that in 2009, four female BBC journalists that were perceived to be anti-FGM were kidnapped, stripped, and marched through the

streets in the city of Kenema before being released. In this instance, the punishment was meted out solely by women opposed to what they viewed as the meddling influence of the Western reporters (Goldberg, 2009). However, academic research (Gruenbaum, 1991; Mackie, 1996; Adongo et al, 1998; Missailidis and Gebre-Medihan, 2000) tells a different story. These studies all cite marriageability as a primary reason for the continuation of the tradition. Sakeah et al. (2006) point out that men are in a sense responsible for the perpetuation of FGM, as they often prefer marriage to women who are circumcised, thus creating an incentive for families to circumcise their daughters. The psychological trauma of having one's sexuality literally removed also cannot be discounted as a factor in the subjugation of women to men. In such an environment, I would argue, girls learn at an early age that they must do what is necessary (even at the cost of their own sexuality) to please men. And if what men want is many children, women will conform to their husband's wishes regardless of their own, resulting in higher fertility rates than would otherwise be the case. Very little prior research exists on the connection between FGM and fertility. That which does exist focuses primarily on FGM as a proximate factor; for example, Larsen and Yan's (2000) research on the effects of FGM on a woman's physical ability to bear children. The theoretical model outlined in this dissertation sees FGM primarily as a distal factor in the fertility decision equation. As previous cultural explanations of fertility have targeted son preference as a possible factor, a short discussion of its absence in this dissertation's theoretical model is in order here. Some of the literature outlined in Chapter 1 argues that a cultural preference for sons also can proximally affect the fertility rate by providing a reason to "keep trying for

a boy.” In turn, the argument goes, striving for a son (or sons) when family planning occurs within the relationship dyad can increase the number of children born overall. However, this preference is likely becoming less influential for fertility rates in the age of selective abortion, dubbed “femicide” by some activists. For example, traveling ultrasound/abortion units offering detection and disposal of a female fetus have become popular in India in recent years. This innovation has likely contributed to the reduction of fertility rates in rural areas of that country. The same practice has also undoubtedly influenced Chinese fertility rates, meaning that this particular technological shift in fertility medicine has undermined the importance of son preference as a proximate factor (Coal and Bannister, 1994). Given the mixed results of quantitative studies gauging the effect of son preference on fertility, together with the increase in son preference fulfillment via femicide—and thus decrease in the effect of son preference as a proximate factor, combined with the unreliability/unavailability of the data on this variable, I do not consider son preference to be a currently significant factor in the fertility equation, and thus do not include it in the model.

The premise upon which this research rests is that a decline in fertility occurs primarily because of women’s cultural emancipation from men, not because of the decreased need for children resulting from urbanization and higher GNI per capita (as many modernization theorists would posit). Following this premise, I postulate a set of seven hypotheses to be tested:

Hypothesis 1: *GNI per capita does not significantly affect fertility.*

Hypothesis 2: *Women’s education has a weak negative effect on fertility.*

Hypothesis 3: *Women's participation in the workforce has a weak negative effect on fertility.*

Hypothesis 4: *Islam as a dominant religion has a strong positive effect on fertility.*

Hypothesis 5: *The practice of polygyny has a strong positive effect on fertility.*

Hypothesis 6: *Women's inclusion in positions of political power has a weak negative effect on fertility.*

Hypothesis 7: *The practice of female genital mutilation (FGM) within a country has a strong positive effect on fertility.*

Chapter 4: Data and Results

Total Fertility Rate

Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. The source for these data was the World Bank's World Development Indicators, which gathered its data from the following sources: (1) United Nations Population Division. 2009. World Population Prospects: The 2008 Revision. New York, United Nations, Department of Economic and Social Affairs (advanced Excel

tables). Available at <http://esa.un.org/unpd/wpp2008/index.htm>. (2) Census reports and other statistical publications from national statistical offices, (3) Eurostat: Demographic Statistics, (4) Secretariat of the Pacific Community: Statistics and Demography Programme, (5) U.S. Census Bureau: International Database, and (6) household surveys conducted by national agencies, Macro International, and the U.S. Centers for Disease Control and Prevention.

GNI per capita

GNI per capita (formerly GNP per capita) is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. GNI, calculated in national currency, is usually converted to U.S. dollars at official exchange rates for comparisons across economies, although an alternative rate is used when the official exchange rate is judged to diverge by an exceptionally large margin from the rate actually applied in international transactions. To smooth fluctuations in prices and exchange rates, a special Atlas method of conversion is used by the World Bank. This applies a conversion factor that averages the exchange rate for a given year and the two preceding years, adjusted for differences in rates of inflation between the country, and through 2000, the G-5 countries (France, Germany, Japan, the United Kingdom, and the United States). The source for these data was the World Bank's World Development Indicators database, which in turn sourced

this variable from: (1) World Bank national accounts data, and (2) OECD National Accounts data files.

Female Labor Force Participation

Labor force participation rate is the proportion of the population ages 15 and older that is economically active: all people who supply labor for the production of goods and services during a specified period. The source for these data was the World Bank's World Development Indicators database, which gathered the measure from the International Labour Organization's Key Indicators of the Labour Market database.

Female to Male Secondary Enrollment Ratio

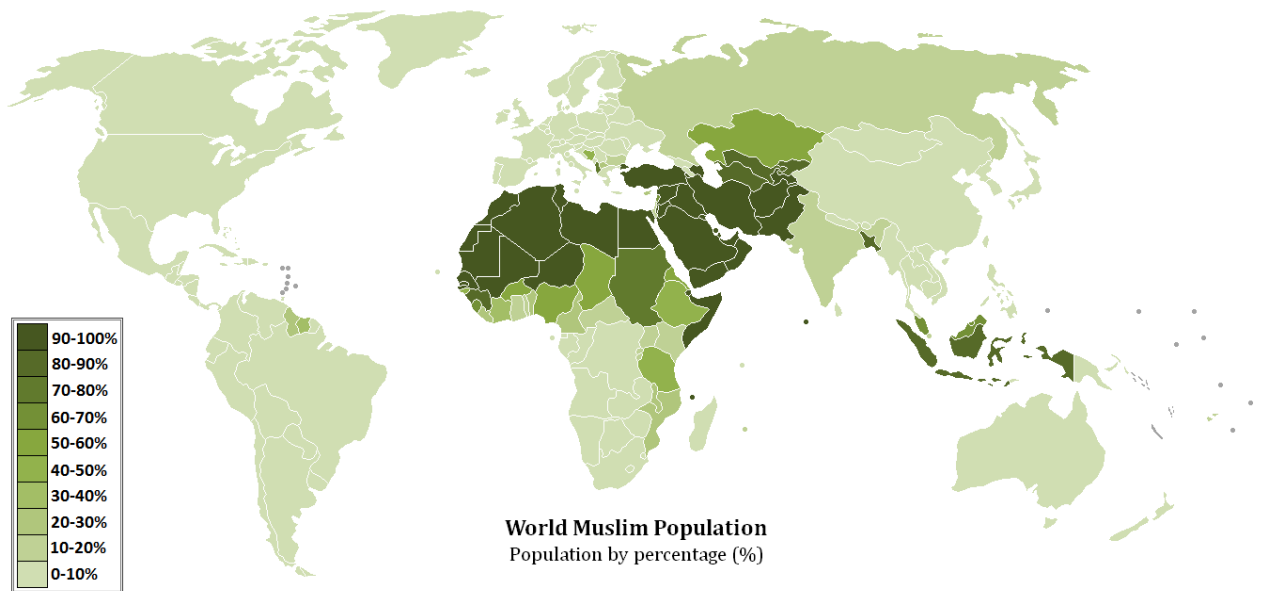
The female to male secondary enrollment ratio is the ratio of women to men who are currently enrolled in higher education. Secondary education enrollment normally requires, as a minimum condition of admission, the successful completion of education at the primary level. The source for the data was the World Bank's World Development Indicators database, which collects the information for that variable from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.

Islam

The national data on Islam are retrieved from the CIA's World Factbook (2007), and though originally reported in this source as percentage figures as seen in the map below (Figure 3), were dummy-coded as 0 for non-majority Muslim and 1 for majority (over

50%) Muslim, as the distribution showed a tendency toward either a majority Muslim population or a non-existent Muslim population.

Figure 3



Polygyny

The data on polygyny were taken from Stanford economist Michele Tertilt's (2005) working paper on polygyny and economic savings. These data, in turn, were retrieved from the United Nations (1990) and Bankole and Singh (1998), using the latest year available for each country.

FGM

The data I used to measure FGM were taken from the WHO (2005) statistical report on FGM. The typology constructed by the WHO is outlined previously in an abbreviated

form. The first three types of mutilation were included in the data, along with most forms of the fourth type, which the WHO defines as

4. Unclassified, which includes pricking, piercing, or incising of the clitoris and/or labia; stretching of the clitoris and/or labia; cauterization by burning of the clitoris and surrounding tissue; scraping of tissue surrounding the opening of the vagina (angurya cuts) or cutting of the vagina (gishiri cuts); introduction of corrosive substances or herbs into the vagina to cause bleeding or to tighten or narrow the vagina; and any other procedure that can be included in the definition of female genital mutilation noted above. (WHO, 1997)

However, I excluded the “symbolic” mutilation form that occurs in some areas (Indonesia, Malaysia, etc.) in which a female child is ritually pricked in the genital region with a sharp object while in early infancy. Although this form is included in the fourth type of FGM as outlined by the WHO, it does not cause permanent physical damage (Rahman Isa, et al., 1999) and, occurring so early in life, is presumably not remembered by adult women, therefore not causing significant psychological trauma either.

Descriptive Statistics

The mean drop in the total fertility rate in the time period studied is .84, or almost 1 child per woman, on average. Table 1 lists the net drop in children born per woman for each country for the time period from 1990-2006. Only one nation, Timor-Lest (East Timor), experienced a net fertility increase in the period 1990-2006. This outlier can likely be explained by that country’s armed resistance struggle for independence, lasting from about 1991-1999, which notoriously included mass rapes of women from villages suspected of rebel sympathies. There is also one other outlier nation, Bhutan, which experienced a fertility decline of 4 children per woman. On the whole, the patterns seem

clear: Countries who had by 1990 already experienced the demographic transition (core countries, for the most part), do not experience any fertility change due to a floor effect. There are also a number of extremely poor or conflict-ridden nations (eg., the Congo, Sierra Leone, Uganda) that do not experience a fertility decline. A few countries have seen a large (3 or more) reduction in the number of children. Those nations are primarily oil-rich nations in Southwest Asia/North Africa. A larger group of countries experienced a net drop of 2 children per woman; these are primarily politically stable peripheral countries. An even larger group of countries saw a drop of 1 child per woman. These countries show a bimodal distribution: those that are semi-peripheral and have nearly completed the fertility transition and those in another group that share the distinction of being among the poorest and least politically stable of the peripheral countries, with a strong concentration in sub-Saharan Africa. Although 198 countries are shown in Table 1, it must be noted that only 79 of these were included in the regression analysis, due to a lack of available data for other variables. Most of the countries that lacked these data were small island nations, with all major countries being included.

Islam as a nation's dominant religion, while a nominal measure, can be used in the linear regression model as an independent variable due to the interval property it possesses as a dichotomous measure. The map seen previously (Figure 1) shows the distribution of majority Muslim nations, all clustered in North Africa, South and Southwest Asia.

As with Islam, a listing of cases shows a strong regional tendency for the practice of FGM (Table 2). Countries where FGM is prevalent are geographically limited to

Southwest Asia, Northeast Africa, and portions of Sub-Saharan Africa. While a minor, non-permanent form of FGM takes place in parts of Southeast Asia, these countries are not included as practicing true FGM for reasons explained previously. It should be noted that the prevalence of FGM varies within nations; generally speaking, it is much more prevalent in rural than in urban areas, although some countries exhibit FGM rates as high as 90% for women over the age of 13.

Table 1 (Decline in number of children per woman by country)

-2	0	1	1 (continued)	2	3	4
East Timor	Australia	Angola	Macedonia	Albania	Algeria	Bhutan
	Austria	Argentina	Madagascar	Bahrain	Cambodia	
	Barbados	Armenia	Malawi	Botswana	Iran	
	Belgium	Azerbaijan	Malaysia	Cameroon	Laos	
	Burundi	Bahamas	Malta	Cape Verde	Maldives	
	Channel Islands	Bangladesh	Mexico	Comoros	Namibia	
	China	Belarus	Micronesia	Cote d'Ivoire	Oman	
	Republic of the Congo	Belize	Moldova	Djibouti	Saudi Arabia	
	Cuba	Benin	Mozambique	Ethiopia		
	Denmark	Bolivia	Myanmar	Gabon		
	Dominican Republic	Bosnia and Herzegovina	New Caledonia	Ghana		
	Estonia	Brazil	Niger	Guatemala		
	Fiji	Brunei	Papua New Guinea	Honduras		
	Finland	Bulgaria	Peru	Jordan		
	France	Burkina Faso	Philippines	Kyrgyz Republic		
	Germany	Canada	Poland	Lesotho		
	Greece	Central African Republic	Qatar	Libya		
	Guam	Chad	Romania	Mauritania		

Guinea-Bissau	Chile	Russian Federation	Mongolia
Hong Kong	Colombia	Rwanda	Morocco
Iceland	Costa Rica	Samoa	Nepal
Ireland	Croatia	Sao Tome and Principe	Nicaragua
Israel	Cyprus	Senegal	Nigeria
Italy	Czech Republic	Seychelles	Pakistan
Liberia	Dem. Rep. of the Congo	Singapore	Paraguay
Luxembourg	Ecuador	Slovak Republic	Solomon Islands
Mali	Egypt	Somalia	Sudan
Mauritius	El Salvador	South Korea	Syrian Arab Republic
Montenegro	Equatorial Guinea	Sri Lanka	Tajikistan
Netherlands	Eritrea	St. Lucia	United Arab Emirates
Netherlands Antilles	French Polynesia	St. Vincent	Uzbekistan
New Zealand	Gambia	Suriname	Vietnam
North Korea	Georgia	Swaziland	Yemen
Norway	Guinea	Switzerland	
Panama	Guyana	Tanzania	
Portugal	Haiti	Togo	
Puerto Rico	Hungary	Tonga	
Sierra Leone	India	Tunisia	
Slovenia	Indonesia	Turkey	
South Africa	Jamaica	Turkmenistan	
Spain	Japan	Ukraine	
Sweden	Kazakhstan	Uruguay	
Thailand	Kenya	Vanuatu	
Trinidad and Tobago	Kuwait	Virgin Islands	
Uganda	Latvia	Zambia	
United Kingdom	Lebanon	Zimbabwe	
United States	Lithuania		
Venezuela	Macao		

Bahrain	Malawi
Benin	Mali
Burkina Faso	Mauritania
Cameroon	Niger
Central African Republic	Nigeria
Chad	Oman
Comoros	Qatar
Cote d'Ivoire	Saudi Arabia
Djibouti	Senegal
Egypt	Sierra Leone
Eritrea	Somalia
Ethiopia	Sudan
Ghana	Tanzania
Guinea	Togo
Guinea-Bissau	Uganda

Liberia	United Arab Emirates
Kenya	Yemen

Table 2: Countries where FGM is prevalent

Polygyny also can be used as an independent dummy-coded variable for the same reasons outlined for FGM. Polygyny, like FGM and Islam also displays a strong regional tendency. Countries where polygyny is prevalent are geographically limited to Southwest Asia, Northeast Africa, and most of Sub-Saharan Africa, as illustrated in Figure 4.

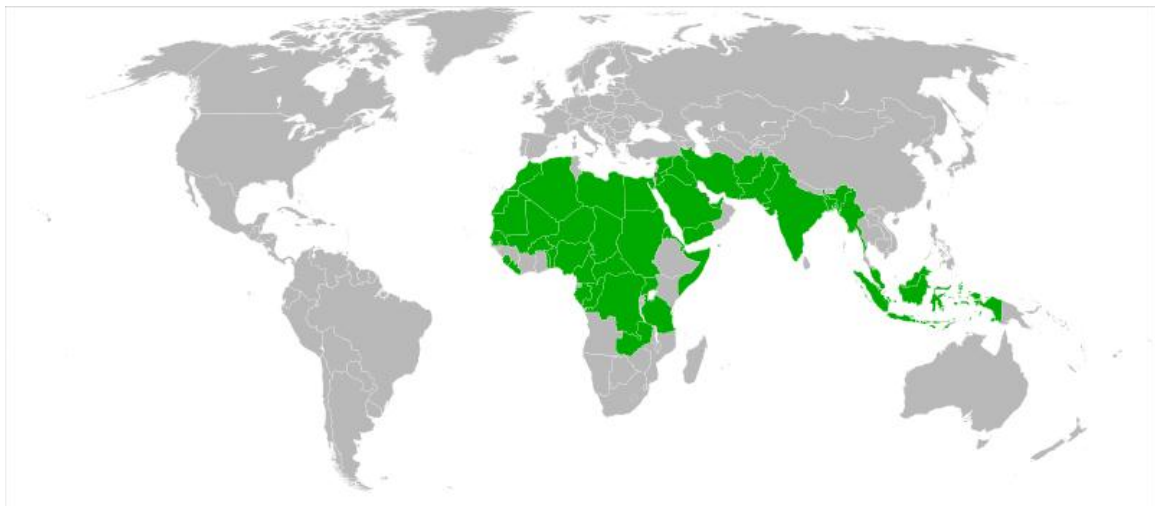


Figure 4: Regional prevalence of legal polygyny

The average total fertility rate in 1990 for the 79 countries included in the data was 3.71 children per woman. However, this statistic is not weighted for population, and thus should not be considered an accurate “global” estimate (the same applies to the rest of the statistics discussed in this paragraph). Gross national income per capita has a mean of \$6232.28 (as measured in current US dollars) for the 79 countries listed. The average

enrollment of females to males in secondary education is 88.54 (where 100 would be exact parity). The mean for participation in the labor force is 38.16%, meaning that the global average for women as a percentage of the paid workforce is roughly 38%, significantly less than the average of women in secondary enrollment. The percentage of all parliamentary seats held by women in 1990 was, on average, 10.25 %. The last three indicators (Islam, polygyny, and FGM) are dummy-coded, and thus their means should be interpreted as the proportion of nations in the sample to which these conditions apply. 23% of the nations in the sample are Islamic, 44% have legal polygyny, and 14% practice FGM widely. For a listing of these means, see Table 3 below.

Descriptive Statistics		
Variable (n = 79)	Mean	Std. Deviation
Total Fertility Rate (2006)	2.76	1.51
Total Fertility Rate (1990)	3.71	1.82
GNI per Capita (1990)	6232.28	8706.97
% Labor Force Female (1990)	38.16	8.40
% Women in Secondary Enrollment (1990)	56.92	34.54
Ratio of Female-to-Male Secondary Enrollment (1990)	88.54	24.65
% Parliamentary Seats Held by Women (1990)	10.25	9.25
Islam as Dominant Religion	0.23	0.42
Polygyny Legal	0.44	0.50
FGM	0.14	0.35

Table 3: Listing of means for all variables

Bivariate Statistics

Examination of the bivariate correlation table (Table 4) yields several findings. As expected, most of the independent variables are significantly correlated with fertility change, particularly the total fertility rate in 1990. There is a particularly high and

significant negative correlation (-.588) between the total fertility rate in 1990 and GNI per capita in 1990. At first glance, this appears to provide support for the economic model. However, as we will soon see, this support does not extend to the multivariate linear regression. Strong and significant correlations also exist between the total fertility rate in 1990 and the polygyny (correlation = .647) and FGM (correlation = .599) variables. The Islam variable, interestingly, is more strongly correlated (correlation = .366) with fertility change than with either polygyny (correlation = .334) or FGM (correlation = .284). Also interesting is the direction of the relationship between Islam and fertility change—it is positive—contradicting the research hypothesis for this variable. Furthermore, there is a moderate correlation between FGM and polygyny (correlation = .490). Correlations between the other variables are present, but weaker, for the most part. Because there are correlations between multiple variables that appear somewhat high, an examination of the variance inflation factor of each independent variable in the multivariate regression model is warranted.

		TFR	GNI	LAB	EDR	PAR	ISL	POL	FGM
TFR 1990 (TFR)	r	-	-	-	-	-	-	-	-
	Sig	1	0.588**	-0.088	0.652**	0.293**	0.285**	0.647**	0.599**
	N	192	149	182	109	130	189	189	191
GNI per capita (GNI)	r	0.588**	1	0.030	0.374**	0.285**	-0.161*	0.392**	0.222**
	Sig	0.000		0.723	0.000	0.002	0.049	0.000	0.006
	N	149	152	145	96	121	151	150	151
% labor force fem (LAB)	r	-0.088	0.030	1	-0.790	0.342**	0.437**	-0.171*	-0.090
	Sig	0.236	0.723		0.413	0.000	0.000	0.022	0.228
	N	182	145	183	109	126	182	180	182
Secondary ratio (EDR)	r	0.652**	0.374**	-0.790	1	0.203	0.311**	0.504**	0.569**
	Sig	0.000	0.000	0.413		0.064	0.001	0.000	0.000
	N	109	96	109	110	84	109	109	110
% women in par	r	0.293**	0.285**	0.342**	0.203	1	-0.171*	0.268**	-0.159
	Sig								

(PAR)	Sig	0.001	0.002	0.000	0.064	0.047	0.002	0.067
	N	130	121	126	84	135	135	133
Islam	r	0.285**	-0.161*	0.437**	0.311**	-0.171*	1	0.418**
(ISL)	Sig	0.000	0.049	0.000	0.001	0.047	0.000	0.000
	N	191	151	182	109	135	208	201
polygyny	r	0.647**	0.392**	-0.171*	0.504**	0.268**	0.418**	1
(POL)	Sig	0.000	0.000	0.022	0.000	0.002	0.000	0.000
	N	189	150	180	109	133	201	202
FGM	r	0.599**	0.222**	-0.090	0.569**	-0.159	0.284**	0.535**
(FGM)	Sig	0.000	0.006	0.228	0.000	0.067	0.000	0.000
	N	191	151	182	110	133	204	202

Table 4: Bivariate correlations

Multivariate Statistics

R	R²	F	Sig.
0.729	0.532	9.953	0.000

Table 5: R² and F-values

Interpreting the beta coefficients

Because the dependent variable is a change score, a positive beta value represents an independent variable that is correlated with a decline in fertility in 2006. In other words, a greater beta value represents more fertility decline, and a lesser beta value a lesser amount of fertility decline. Conversely, a negative beta value means that the independent variable affects fertility decline adversely.

In Table 6, the beta coefficients, t-test values, and variance inflation factors (VIFs) are reported. Upon examination of the VIF figures, it is evident that none of the variables display multicollinearity, as the standard threshold for multicollinearity is a VIF of 4 or more. In this model, no independent variable has a VIF higher than 3.

Variable	B	Std. Error.	Beta	t	Sig.	VIF
(Constant) [Total Fertility Rate (1990 - 2006)]	-0.238	0.604		-0.394	0.695	
Total Fertility Rate (1990)	0.343	0.063	0.754	5.415	0.000	2.899
GNI per Capita (1990)	-3.875E-6	0.000	-0.041	-0.378	0.706	1.726
% Labor Force Female (1990)	-1.644E-2	0.009	-0.191	-1.770	0.081	1.745
Ratio of Female/Male Sec. Enrollment (1990)	6.862E-3	0.004	0.204	1.855	0.068	1.803
% Parliamentary Seats Held by Women (1990)	-3.291E-3	0.008	-0.037	-0.389	0.699	1.331
Islam as Dominant Religion	0.476	0.223	0.242	2.135	0.036	1.922
Polygyny Legal	-9.524E-2	0.197	-0.057	-0.484	0.630	2.096
FGM	-0.546	0.246	-0.229	-2.217	0.030	1.595

Table 6: Beta coefficients, *t*-test values, and variance inflation factor values

Total fertility rate in 1990

Total fertility rate in 1990 is included in order to control for fertility rates at the 1990 time period as in a true panel analysis. Naturally, those countries that have higher levels of fertility in 1990 have more room to reduce that fertility than do those with lower

levels of fertility; the latter being hampered by the above-mentioned floor effect. The statistics from the regression model support this hypothesis; the relationship between the fertility rate in 1990 and fertility level in 1990-2006 is both strong ($\beta = .754$), positive, and significant ($p < .000$). This variable likely is the major contributor to the relatively high Pearson's R for the model ($R = .729$).

GNI per capita

Gross national income per capita for 1990 shows a very weak negative effect on fertility decline ($\beta = -.041$), but is insignificant ($p < .706$). The weakness and negativity of the effect cannot be attributed to the floor effect; although one would be inclined to posit that those countries that experience little or no fertility change are often core countries, which correspondingly have higher levels of GNI per capita, the β is larger and still negative ($-.191$) in the regression analysis without the core countries (see Appendix). The surprising finding here is the complete insignificance of this variable in the regression model.

Percentage of labor force that is female

The percentage of the labor force composed of women has a barely insignificant ($p < .081$) negative effect on fertility decline. While the effect is not tremendously strong ($\beta = -.191$), the direction is perhaps surprising. I would argue that the negativity of the relationship is due to the nature of the jobs available to women in many developing

nations; work in maquiladoras or telephone call centers does not serve to liberate women or promote their autonomy in any real sense. In fact, in nations where women are routinely expected to shoulder the double burden of housework/child care and a factory shift, employment may perhaps even serve to repress women's autonomy. There is also the possibility that having a higher proportion of women in the labor force may indicate a society wracked by war, in which men are fighting, while women hold down jobs. As has been reported elsewhere (Weeks et al., 1989; Yusef, 1990; Verwimp and Van Bavel, 2005), wartime violence has a very real positive effect on fertility, in part because of the widespread use of rape as a terror tactic—recall the case of East Timor mentioned previously. It is perhaps of interest that the relationship observed in this analysis becomes even less significant ($p < .275$) when core countries are removed from the dataset.

Female-to-male secondary enrollment ratio

The ratio of female to male enrollments in secondary education has a weak positive effect on fertility decline (.204) that is insignificant ($p < .068$). This finding is not consistent with the research discussed in Chapter 2 that finds the education of women to significantly reduce fertility rates; many of these prior studies have found that the higher the proportion of educated women, the greater the reduction in fertility. The mechanism here has been discussed in previous chapters; as women enroll in greater numbers, they become educated and empowered to take charge of their fertility. Additionally, there is an incentive not to become pregnant in the form of pregnancy/parenthood as a greater

obstacle to obtaining a degree. However, the results of this analysis still necessitate a failure to reject the null hypothesis for secondary education, due to the lack of significance in the relationship.

Percentage of parliamentary seats held by women

The percentage of parliamentary seats held by women in 1990 has a negligible (-.037) effect on the dependent variable. Again, the direction of the relationship is puzzling, as it would seem that having more women in governmental positions should have a positive effect on fertility decline. However, the effect is insignificant ($p < .699$), so the relationship can be dismissed, and the null hypothesis cannot be rejected.

Islam

Whether or not a nation is majority-Muslim does affect fertility decline significantly ($p < .036$). Of note, however, is that the beta is positive (.242), suggesting that the research hypothesis for this variable has no basis in empirical reality. The relationship becomes even stronger (.256) when the core countries are removed from the dataset.

Polygyny

The polygyny measure shows a negative effect on fertility decline, concurrent with the research hypothesis; however, this effect is weak (-.057) and insignificant ($p < .630$). This effect persists when the core countries are removed from the dataset. We must fail to reject the null hypothesis for this variable.

FGM

Multivariate linear regression shows a significant negative effect for FGM on fertility decline ($-.229, p < .030$). Even when the core countries are removed from the regression analysis, the effect is still significant (.009) and in the same direction ($-.335$), so this result cannot be attributed to an overabundance of core countries (which do not practice FGM) in the dataset.

Chapter 6: Conclusions

Based on the results of the data analysis outlined in the previous chapter, it is possible to draw some conclusions about the hypotheses generated in the theoretical model. The first research hypothesis—that GNI per capita has a significant positive effect on fertility decline, but less of an effect than previously thought—is utterly unsupported by the evidence. We must fail to reject the null hypothesis in this instance, for not only is the relationship between gross national income per capita for 1990 and fertility decline negative, it is also insignificant. While it could be argued that the negativity of the effect is likely due to the aforementioned “floor effect” (in which those countries that experience little or no fertility decline are often core countries, which naturally have higher levels of GNI per capita), it is particularly interesting that the GNI variable is insignificant. This would appear to contradict the body of economic-centered research outlined in Chapter 1 of this dissertation, and indicates that population demographers and those concerned with reducing population growth would do well to focus future research on cultural factors that affect fertility.

The second research hypothesis; that is, that women's education has a moderate positive effect on fertility decline, is not supported by the results of the linear regression. The relationship between women's secondary education enrollment as a ratio relative to men and fertility decline is weak, positive, and insignificant. We can confidently reject the null hypothesis in this instance. This could indicate that the current public policy focus on women's education as the most important factor affecting women's autonomy and therefore reproductive opportunity and decision-making may be somewhat overrated. This observation should not be interpreted as an argument against promoting education among women and girls; rather, it is simply a proposition that female education is simply one tool in the toolkit when it comes to reducing national fertility rates.

The third hypothesis, that women's participation in the workforce has a negligible effect on fertility change, is supported. While the effect is moderate, the relationship is insignificant. Furthermore, the relationship is negative. This could be interpreted as evidence that supports the argument outlined previously in the theoretical model—that the increased employment of women, particularly in developing countries, does not constitute a form of autonomy that translates to lower fertility rates. In fact, the types of low-wage, labor-intensive industries that frequently hire women as “docile” employees that are less likely to unionize or complain about low wages or poor working conditions often choose to locate their operations in countries where women's autonomy is low to begin with. Thus it seems that Jeffrey Sachs' (2006) argument that the maquiladora is the universal path to development for low-income nations is not supported if one considers fertility reduction as a key indicator of development. There is also the possibility that a

higher proportion of women working than men indicates a nation at war, in which the male population has largely perished or is actively engaged in violent conflict. Whatever the explanation, it seems clear that simply boosting women's employment would not necessarily reduce fertility rates, as some Marxist feminists would have us believe. More research is necessary to determine how the type of work that women are performing interacts with the fact of their employment.

One of the most interesting findings in this research was the statistical evidence against the fourth hypothesis; that Islam as a dominant religion has a strong negative effect on fertility decline. On the contrary, while the prevalence of Islam in a nation's population had an insignificant relationship with fertility, the relationship was positive rather than negative. This flies in the face of the prevailing Western popular view that Islam encourages high fertility rates, and that Islamic countries are not making the fertility transition. While some research outlined in Chapter 2 of this dissertation did find that Islam as a national characteristic has no effect on total fertility rates, to my knowledge there is no previous research finding that Islam as a national characteristic affects fertility rates negatively on a cross-national level, although the anthropologist Johnson-Hanks (2006) has found statistical evidence for this relationship within West African nations. This is especially significant and would be worth exploring further in future research. One possible explanation for the negativity of the relationship is that nations with high fertility rates at the beginning of the 1990s had more room for fertility change than those with lower fertility rates. The countries that reduced fertility the most tended to be oil-rich Islamic states such as Saudi Arabia, Oman, Iran, and Algeria, all of

which saw a fertility reduction of 3 children per woman on average during the period under study. These cases may also be viewed as possibly supporting a modernization-centric economic model of fertility.

The fifth research hypothesis, that the practice of polygyny has a moderate positive effect on fertility, was also unsupported by the data. Although there is a close connection between a nation's Islamic status and its approval of polygyny, the two obviously have very different effects on fertility; while Islamic status has a significant positive effect on fertility decline, polygyny has a negative effect on fertility change that is not significant. This finding suggests some support for Becker's theoretical argument that women benefit more from a polygynous marital model than they do from a monogamous one. Becker (1973) posits that the division of output between mates is determined as the solution to a marriage equilibrium. While Becker (1974) emphasizes the importance of sex ratios, he also points out that polygyny drives up the demand for women and thereby increases the share of the marital surplus obtained by women, leading him to conclude that women are "better off" under polygyny than monogamy. According to Becker (1981):

"My analysis of efficient, competitive markets indicates however that the income of women and the competition by men for wives would be greater when polygyny is greater...This view is supported by the fact that bride prices are more common and generally higher in societies with a greater incidence of polygyny." (1981, p 56)

Becker reports that in this regard, his own teachings coincide with those of the Ayatollah Khomeini. In a footnote, Becker quotes Khomeini as follows:

"The law of the four wives is a very progressive law and was written for the good of women since there are more women than men... Even under the difficult conditions which Islam imposes on a man with two or three or four wives, there is equal

treatment, equal affection, and equal time. The law is better than monogamy.’’ (1981, p 60)

Certainly, polygyny does not seem to result in significantly decreased autonomy for women with regard to fertility, which is what I am attempting to determine in this research. Further research on this subject should perhaps focus on individual countries, ideally utilizing Demographic and Health Surveys data to determine if significant fertility differences exist between women in polygamous and monogamous relationships within the same country.

The sixth research hypothesis, that women’s inclusion in positions of political power will have a weak negative effect on fertility, was also unsubstantiated. Not only was the effect negative, but it was also insignificant. We must fail to reject the null hypothesis in this case. This indicates that the inclusion of women in positions of political power does not necessarily translate to greater reproductive autonomy. Perhaps the issue here is the indicator itself—as an indicator of women’s political autonomy, perhaps suffrage or proportion of the electorate that is female would better measure the concept under study. Future research could utilize more “democratic” measures such as these to measure the effect of women’s political autonomy on fertility. However, the danger here is to confuse the effects of political autonomy with the effects of simple democracy on fertility. The above-mentioned indicators only work in situations where participatory or representative democracy is in place. There is still the issue of those nations not operating under a democratic system—how then to measure women’s political autonomy? The measure used in this research at least has the advantage of being applicable to almost all nations, regardless of the form of political system.

The last research hypothesis is the one dearest to my own heart, and the one that sparked my interest in the research that led to the writing of this dissertation. That is the hypothesis that the practice of female genital mutilation has a strong negative effect on fertility decline. While FGM did not have as strong an effect on fertility change as I anticipated (beta = -.229), the relationship is significant ($p < .030$) and negative. This appears to validate the theoretical model's argument that FGM has a significant effect on fertility over and above some of the other factors that often co-occur with FGM, such as a low GNI per capita, polygyny, and Islam. Of all the independent variables in the theoretical model, FGM has the strongest and most significant effect on fertility change.

Such a finding indicates the need for future research on the topic. As multivariate linear regression is limited in its ability to substantiate causality, it would be useful to test this relationship in the future for spuriousness, perhaps by utilizing structural equation modeling techniques with the FGM variable, some other variable that could potentially be the causal variable, and the dependent variable. A likely candidate for SEM analysis of this type would be the degree of tribal solidarity that exists in a country, as areas where FGM is most prevalent tend to be those in which a high degree of tribalism is also prevalent, and both the proportion of women who have been subjected to FGM and the severity of the type of FGM practiced tends to increase with greater tribal solidarity. For public policy purposes, the findings of this dissertation suggest that the ending of the practice of FGM could perhaps lead to an increasing of the speed of the fertility transition. This is data that supports such political gestures as the signing of the Maputo Protocol by African Union countries in 2005. The Maputo Protocol prohibits all forms of

female genital mutilation, in addition to making other significant provisions for women's rights in Africa. However, as with all such protocols, the key is its enforcement, which is politically unlikely in many African countries. Alternatively, if cultural arguments about the central importance of the female circumcision tradition are convincing to African policy-makers and legal enforcers, perhaps it would be prudent to consider fertility rates in Indonesia and Malaysia, where total fertility rates have declined by over 40% since the late 1960s (Freedman and Blanc, 1992), and where a largely symbolic female circumcision takes place: infant girls are not permanently harmed, but are instead ritually pricked by a sharp object when very young (Rahman, 1999). This type of non-damaging circumcision could perhaps be promoted as a compromise between those loath to abandon tradition and those who wish to promote women's rights and the fertility transition. While any external attempt to modify a nation's cultural traditions would understandably be perceived as meddling, nations wishing to modernize and reduce the social ills created by overpopulation would do well to consider the connection between FGM and high fertility when developing public health programs and population policy.

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Appendix

Variable	B	Std. Error.	Beta	t	Sig.
(Constant) [Total Fertility Rate (2006)]	0.236	0.623		0.379	0.707
Total Fertility Rate (1990)	0.303	0.080	0.653	3.806	0.000
GNI per Capita (1990)	-3.48E-05	0.000	-0.191	-1.185	0.243
% Labor Force Female (1990)	-1.49E-02	0.013	-0.171	-1.105	0.275
Ratio of Female-to-Male Tertiary Enrollment (1990)	4.94E-03	0.002	0.377	2.833	0.007
% Parliamentary Seats Held by Women (1990)	-4.76E-04	0.012	-0.005	-0.038	0.970
Islam as Dominant Religion	0.501	0.283	0.256	1.773	0.084
Polygyny Legal	-1.32E-01	0.219	-0.085	-0.604	0.549
FGM	-0.756	0.277	-0.335	-2.730	0.009

Table 6: Beta coefficients and T-test values (dataset with core countries removed)