

# **Cultural vs. Economic: Re-Visiting the Determinants of Fertility at a Sub-National Level in the U.S, 1990 - 2010**

**Jeremy R. Porter**

Assistant Professor

City University of New York's

Brooklyn College, Department of Finance and Business Management

Graduate Center, Department of Sociology and Criminal Justice

## **ABSTRACT**

*It is widely accepted that through the past century, and especially since 1950, the world population has grown at an accelerating pace landing the current world's population at about 6.5 billion and, according to UN projections, it is expected to reach 9.1 billion by 2050 (Bongaarts 2005). However, this growth is not uniform and tends to vary both regionally and intra-regionally around the world (Bongaarts 1998). There are competing theories as to the true determinants of fertility levels and these identified patterns (Caldwell 2001). The bulk of these theories pit economic determinants versus socio-cultural determinants as the primary indicators concerning the onset of fertility decline. However, most of this work has had an international focus with very few examining sub-national trends in fertility patterns. This paper draws on the work of one study which examined sub-national trends in the U.S. in hopes of better understanding current trends in determining fertility in the U.S. (Cutright 1983). An OLS regression approach is employed allowing for the examination of the two competing theories. Findings suggest that, while both are certainly significant, the role of economic determinants.*

## **1. INTRODUCTION**

It is widely accepted among social scientists that in the past century, and especially since 1950, population has grown at an accelerating pace landing today's world's population at about 6.5 billion and, according to UN projections, is expected to reach 9.1 billion by 2050 (Bongaarts 2005). Population size is increasing at an increment of about 75 million per year and most of that growth is occurring in the developing world including Africa, Asia and Latin America (Bongaarts 2005). According to Bongaarts, Africa has nearly quadrupled in size since 1950 and is expected to double again by 2050 in spite of the AIDS epidemic and Asia, the largest region in the world, has tripled since 1950 and is expected to add another 1.5 billion by 2050. Latin America has also experienced significant growth in the past and that growth is expected to continue over the next several decades (Bongaarts 2005). However, the developed world is expected to see little change. The developed world, on the other hand, is expected to remain at its current size for the next several decades and even expected to decline after 2050. These differences can be widely attributed to differences in fertility rates and the degree to which those rates have declined (Bongaarts 2005). Furthermore, these differences seem to be consistent among societies, most often coinciding with some form of transition from less developed to more developed status.

The demographic transition is at the core of demography and refers to the historical shift from a society with high mortality and high fertility with little to no population growth to one with low

mortality and continued high fertility and finally to a society with low mortality and low fertility and a stable population. Over time, as countries have moved through the stages of the demographic transition, shifts in fertility and mortality rates have been accompanied by social, cultural, and economic development. Meaning that there are measurable indicators of development that can be directly or indirectly associated with the phenomena of interest to this study.

However, that being said, there is currently an argument concerning the primary source of these indicators. The existing literature contains a number of different explanations driving the transition from high to low fertility, which include both culturally and economically related determinants. All are interested in one question, "What is the actual cause of the fertility transition?" This is perhaps the biggest argument or disjuncture in the existing literature on the fertility transition, and one the current paper hopes to help better understand. To date, most of the existing literature on the fertility transition has been at the national level. However this study is interested in this phenomenon at the sub-national level within the U.S., as there is a definite void in the literature concerning intra-national trends over the past 20-30 years.

The following literature review discusses some of the intra- and international trends in fertility, gives an overview of some of the established theories purported to explain shifts and differentials in fertility levels, specifically economic and cultural theories of fertility. Finally, this study attempts to provide significant support for a connection between differing levels of fertility and both economic and cultural indicators of development at the county level.

## **2. LITERATURE REVIEW**

### *2.1 Fertility in the U.S.*

The fertility transition is well established in most developed countries including the United States. In fact, some regions have fertility rates that are falling below replacement level (Bongaarts 2005). The United States, however, has fertility rates that are just above replacement level (2.1 children per woman according to the U.S. Census Bureau) (Bongaarts 2005). Over time, in developed countries such as the United States, age at first marriage has consistently increased, accompanied by substantial changes in the attitudes toward women in the workforce (Rindfuss et al. 1996). As a result, many women are choosing to have fewer children and have those children later in life and some women, by choice or otherwise, are never having children at all.

Further research has shown that policies aimed at increasing the supply of childcare or to lower its costs could increase the female labor supply by a substantial fraction while having the greatest impact among women most at risk of poverty (Mason and Kuhlthau 1992). These issues are based on the increased integration of women into the workforce both through the delay of childbearing and the acceptance of outside-the-home childrearing, which has continued to develop as a pattern over recent decades (Rindfuss et al. 1996). In fact, in the U.S., the number of women who will not have a first birth is increasing and the average age of first birth is increasing across white cohorts (Bloom 1982). However, there are increases in the number of children born to non-white cohorts at earlier ages (Bloom 1982). The increase for non-white cohorts may be somewhat impacted by the fact that immigrants moving to the U.S. tend to be from high fertility countries and bring with them the fertility behaviors directly associated with the sending countries (Kahn 1988).

The increase in non-white births at early ages for non-whites is also increasingly associated with births outside of wedlock (Hogan and Kitegawa 1985). According to the Census Bureau, 32% of all never married, divorced or widowed women in the U.S. who gave birth, 62% were to black women whereas only 25% were to white women. Researchers suggest that, in the poor minority context, blacks tend to delay marriage due to economic uncertainties, while promoting premarital parenthood as a way of

achieving adulthood (Hogan and Kitegawa 1985). Trussel (1988) points out that one in ten women age 15-19 becomes pregnant each year with five out of six being unintended. This research suggests that there is a pool of poor and racial minority teenagers who see little benefit in postponing parenthood (Trussel 1988). Indeed, studies have shown that blacks from high-risk backgrounds are three times more likely to have a premarital birth than those from low-risk backgrounds and that racial differences in premarital births arise because black women are more likely to come from high-risk backgrounds and, even among all women from low-risk backgrounds, black women are more likely to have premarital births than white women (Bumpass and McLanahan 1989). However, other researchers have shown that the effects of income and change in family structure are independent in relation to their association with premarital births (Wu 1996).

Fertility decline has been described as one of the most profound social revolutions of the period. It has developed due to and been the facilitator of ramifications associated with the social and economic history of the United States, including women's ability to participate in the paid labor force, parental resources available for children's education, the age structure of the population and even the future of the social welfare state (Hacker 2006). As a result, this phenomenon has been well-researched and, as the literature suggests, a number of factors have been linked to it. Within the sociological literature on fertility decline, however, there is one primary debate concerning its determinants, namely the debate between proponents of economic and cultural theories of fertility.

### *2.2 Theories of Fertility*

One very important aspect of the demographic transition is the shift from natural and high fertility to controlled and low fertility, better known to demographers as the fertility transition. Many theories have been posited to explain this phenomenon, but most theories are influenced by economic and/or socio-cultural factors (Weeks 2005). Economic theorists see humans as rational beings that make decisions based on supply and demand. Socio-cultural theorists, on the other hand, rely on the innovation/diffusion perspective, which posits that much of human behavior is driven by one's surrounding culture or what is "in style" at that time. This section hopes to outline and delineate between the two competing (yet sometimes supplementary) frameworks.

### *2.3 Economic Demand Determinants of Fertility*

Some researchers believe that individual couples make decisions on having children based on the potential contributions and costs associated with them. One of the first and most visible proponents of this idea was Gary Becker. Gary Becker (1960) posits that each individual household is a mini-factory in which goods are produced. Each of these goods directly contains a monetary value, which is associated with the price one must pay in the public marketplace for such a good. Becker further states, that as wages for women begin to rise in the public sphere it is no longer economically reasonable for them to work from the home due to the disjuncture in wage tradeoff (1960). As the women are no longer in the household this directly leads to the sacrifice of family and child-rearing, primarily associated with the potential fertility of that household (Becker 1960).

Subsequent and related research on the economic determinants of fertility has examined demographic change in relation to what is called the "economic invisible hand" (Demenev 1986). The invisible hand theory, in relation to demographic change, works much the same way as the invisible hand theory in general economics. In general, the demand for a commodity will drive up its worth, while an oversupply will drive down its worth. In the West, the invisible hand has affected demographic change based on the decreasing economic benefit and the increasing direct cost of children to parents, the rising opportunity cost of children, the socialization of old age support, and the shift in power toward the elderly as a result of population aging (Demenev 1986).

Another economic theory of fertility transition, which attempts to understand this process as a cohort phenomenon, is the Easterlin Relative Cohort Hypothesis. Unlike some other economic theories, however, the Easterlin Hypothesis points out that the birthrate did not necessarily respond to absolute economic well-being but instead to relative levels to which the individual is accustomed. The hypothesis assumes that if the standard of living you experience in late childhood will be easy to maintain in adulthood, then the individual will be more likely to marry early and have children. In contrast, if the maintenance of a similar lifestyle seems to be more difficult, then the individual is likely to delay marriage and fertility in order to increase their chances. In principle, the increase in relative cohort size, which occurs as a product of mortality decline, creates a high proportion of young adults, which in turn generates downward pressure on their wages, ultimately causing a trade-off in general well-being and family size.

The Easterlin Hypothesis is predicated on the thesis that economic change drives demographic change. As an example, before 1960, young males were in an increasingly short supply and their relative economic position was substantially high. However, since the early 1960s, the relative condition of young males has deteriorated and marriage has been increasingly deferred and fertility reduced (Easterlin 1978). Research comparing Easterlin's cohort model to Becker's overall economic model, tested the hypothesis of relative income and tend to favor the Becker model (Behrman and Taubman 1989).

Research interested in examining the economic consequences of delayed childbearing and reduced family size find that, by retirement age, women who bore their first child at 30 or older are better off economically than those who bore children at younger ages and those who are childless (Hofferth 1984). The findings from Hofferth (1984) also suggest that limiting to one or two children appears to be economically more beneficial than having more than two children or being childless. Furthermore, research has shown that the delay of childbearing in the U.S. has increased the duration of simultaneous responsibility to young children and elderly parents (Menken 1985, Preston 1984). In light of these and other similar findings, it is not surprising to see why so many researchers and theorists have relied heavily on economically driven explanations of fertility.

#### *2.4 Social/Cultural Determinants of Fertility*

However, economic theories of fertility are not without their critics. Blake (1968) critiques the economic theories of reproductive behavior pointing out that there are a number of reasons for concluding that the economic model is inapplicable to children and, hence, cannot predict fertility differentials by income. Blake (1968) further points out that by simply looking at reproductive motivation rather than economic demand, the poor seem to share in the pronatalist motivational pressures but do not share in the antinatalist pressures affecting the upper and middle class income groups. The pronatalist pressures encompass being a parent and living in a family setting, while the antinatalist pressures include the quality requirements and, since poor children live with poor parents, they do not see an overall decrease in their relative standard of living. Furthermore, other recent research has shown that, in the U.S., children are not seen as consumer durables, but instead are sought after as the fulfillment of our drive to create strong familial social bonds (Shoen et al. 1997).

Following the European Fertility Project, findings suggested that there were a number of potential explanations concerning regional differences in fertility declines. Some centered on the demographic transition and the fact that perhaps the fertility transition was socially determined by preceding transitions such as the mortality transition, which was fueled by advancements in medicine and medical technology (Davis 1963). In particular on theory, known as the theory of demographic change and response, examined what happens to individuals within a given society as mortality declined (Davis 1963). He found that, in these societies, a larger number of children were reaching adulthood (do to lower infant mortality), putting pressure on the family's resources. This led to an individual response to the demographic shift in mortality, with a shift in personal recreational ideas in order to

relieve the pressure. The second generation, then, will consciously have smaller families in order to avoid the issues of financial pressure, which faced their parents. Davis sees the individual as an actor who makes everyday interpretations of his surroundings and their changes (1963). In this theory, the mortality decline drives the succeeding fertility decline.

Furthermore, research has shown that the demand for family planning services and programs is directly related to promotion of the economic and social development of developing countries (Demenev 1986). Some of the conditions that make changes in the demand which affect the fertility are providing an incentive for increased investment in human capital, providing opportunities for upward social mobility and raising the expectations with respect to material standards of living (Demenev 1986). Other cultural components such as education have proven to be extremely important, although quality of education measured by the adult literacy rate is a much more consistent measure than the simple number of years educated (Cutright 1983).

When examining the transition, via family limitation in developing countries, research has also found that demand for contraception is not being met equally in all regions of the developing world (Westoff and Bankole 2000). Westoff and Bankole (2000) point out that the demand tends to be met in Asia, North Africa and Latin America. However, the reverse is true in Sub Saharan Africa, which the authors suggest should put more energy into encouraging the adoption of modern contraceptive methods (Westoff and Bankole 2000). Other research on the fertility decline in Africa of married women under 35 suggests greater spacing between births and points out that family planning programs are most likely to succeed by making contraceptives available, especially to teenage girls, and by urging women to legitimize their right to make their own fertility decisions (Caldwell et al. 1992).

In the U.S., the fertility transition has followed that of most of Western Europe as the number of women who will not have a first birth is increasing. However, among those having children, racial disparities continue to grow (Bloom 1982). Related research suggests that there is historical evidence concerning the influence of public and social policies and their driving effect on the overall fertility level in these western countries (Knodel and van de Walle 1979). Knodel and van de Walle found patterns which naturally replicated themselves and include the following four components: 1) fertility declines took place under a wide variety of economic demographic conditions (supporting the cultural determinant framework); 2) the practice of family limitation was largely absent prior to the decline in fertility; 3) increases in the practice of family limitation and the decline of marital fertility were essentially irreversible once underway; and 4) cultural setting influenced the onset and spread of fertility decline independently of socioeconomic conditions.

In a case study examining the fertility transition in Thailand, findings report that the specific Thai fertility tradition involves social and economic changes, which cause people to see children as a burden, cultural settings conducive to the limitations of family size, latent demand for acceptable means of fertility control, and organized government efforts to provide modern contraceptive methods (Knodel et al. 1984). In another case study on the examination of fertility decline in Bangladesh, the findings conclude that the fertility decline has been accompanied by some remarkable social transitions (Caldwell et al. 1999). Caldwell et al. (1999) found that simply having contraceptives available was not the sole reason for the fertility decline but that there was also an evolution in the demand for a smaller family.

Other non-economically based theories are concerned with the rich variety of family and social systems that exist throughout the world and that one must consider the varying traditional values and alternatives to fertility limitations and their moral acceptance (Mason 1997). Along those same lines,

Cleland and Wilson (1987) found that the timing of the fertility transition is strongly influenced by cultural boundaries as opposed to economic indicators, and the speed with which marital fertility decline takes place is related to the diffusion of new ideas rather than changes in economic forces.

### *2.5 Purpose*

While the U.S. as nation is one of the countries making up the developed world, there exists extreme sub-national variation in a number of determinants of development. Such measures include the demographic processes associated with the transition from less to more developed status on the national level. On that point, the purpose of this paper is to test competing arguments for the fertility transition within the U.S. via the implementation of economically and culturally centered determinants from 1990 – 2010. It is hypothesized that while the nation as a whole fits the description of a developed country in terms of the crude fertility rate, there will be significant differences between units of analysis when examining the rate at the county level based on the above mentioned sub-national variation.

Furthermore, as Caldwell (1986) points out the western nations, and other countries going through the early stages of the demographic transition, tend to rely much more heavily on economic indicators as determinants of fertility. This is in contrast to nations that are currently developing and are currently classified as less developed, which rely more on cultural development as a determinant of fertility as evidenced by stark differences in rich/high fertility Arab countries and poor/low fertility Latin American countries (Caldwell 1986). Based on this finding it is also hypothesized that, even when looking at the sub-national county level, the U.S. fertility rate will continue to be driven by economic determinants even in the face of established socio-cultural development (or lack thereof). However, it is also important to note that, often, the two go hand in hand and may, in fact, have a reciprocal relationship.

## **3. METHODOLOGY**

### *3.1 Data*

Data for this project were obtained from a number of sites, all pertaining to the county level for the lower forty-eight contiguous states (N=3,054). Furthermore, all data pertains to the temporal specific period circa 2010, unless otherwise noted below. Data pertaining to the age-race adjusted birth rates for both 1990 and 2010 as well as on the average life expectancy per county were computed with data obtained from the National Center for Health Statistics (NCHS). Also, data pertaining to the percent of the population that was classified as urban, the U.S. region, the percent of the population non-white, and the number of family planning centers were both obtained from the U.S. Census Bureau, with the family planning centers coming from the economic census and the percent urban and the region from the SF files of the decennial census.

Furthermore, the variable pertaining to the literacy estimates of the county were obtained from the National Institute for Literacy (NIL) and the personal income per capita was obtained from the Bureau of Economic Analysis (BEA). Lastly, the data pertaining to the human ecological footprint (human impact) was obtained from the Wildlife Conservation Society (WCS) as a raster map of the human impact with a thirty meter resolution.

### *3.2 Variable Measurement*

The dependent variables of interest to this study concern the crude birth rate per one thousand individuals within each county. For definitional purposes, the crude birthrate is simply equal to the number of births divided by the total population and then multiplied by one thousand. Furthermore, the crude birthrate has been computed for both 1990 and 2010 and a difference score was computed as the crude birthrate in 2010 minus the crude birthrate in 1990. This series of dependent variables

will allow for the examination of not only the determinants on the year specific birthrates, but also the effect of the determinants on the rate of change from 1990 to 2010.

The independent variables of interest in this study include a number of economic and cultural determinants. All variables were selected based on their inclusion in the last sub-national comparison of economic versus socio-cultural determinants of fertility by Cutright (1983). The economic determinants of interest include a number of variables associated with overall material development of a county. First, the percent urban was computed as the number of residents specified as living in urban areas within each county by the Census Bureau, divided by the total population in the county and then multiplied by one hundred. Also, the personal income per capita is used as a proxy for county level GDP due to the fact that it is not readily available at the county level. However, at the state level the personal income per capita and GDP correlate at less than the .001 significance level with a score of .998. Based on this supplementary analysis, it is assumed that two variables directly measure the same construct.

Lastly, the human ecological footprint of the county is used as the final economic determinant. This variable is directly related to the human impact of an area, which is associated with an area's greater material development. Elements that help make up the human footprint include population density, landuse/land cover, lights visible from satellite at night, roads density, and settlement patterns. The data, in its original format, is a raster image with 30 meter resolution. Each pixel has a value, which is associated with that 30X30 meter areas human impact. The data was processed via GIS, which computed the mean score of each county based on all the pixels that fell within the county boundaries. This variable was logged in order to achieve a decently normal statistical distribution.

The cultural and social determinants of interest include a number of variables that are associated with an area's preference for progressive behaviors concerning fertility behaviors. These variables include the number of family planning/outpatient abortion centers in the county, which directly relates to the cultural acceptance of the external control of fertility. This variable was dummy coded due to the low number of counties that actually had these clinics, with one meaning that a clinic did exist.

The county's literacy rate was used as a measure of the overall quality of education as opposed to the simple attainment of education credentials, as suggested by the above literature review. The literacy variable is not interested in the absolute literacy estimate of the county due to the low variation within developed countries on the variable. The variable is instead interested in the percent of people in the lowest level of literacy. This level of literacy, level 1 literacy, is identified by the NIL as the lowest functional level of literacy. The NIL has identified five categories and level 1 is the lowest of those five categories. Furthermore, the level 1 literacy variable was reverse coded in order to be substantively meaningful so that a high score would indicate a positive outcome, or the percent of people not in the lowest functional literacy classification. Average life expectancy of the county was included as a cultural determinant due to its direct association with a healthy lifestyle and social development. It was measured as the average number of years an individual in the county can expect to live from birth.

Finally, the percent of the population non-white, the U.S. Census region, and the crude birthrate for time one (1990) were all used as controls per the above literature review. The percent of the population non-white was computed by simply adding all individuals that did not identify as white in the census, dividing them by the total population, and multiplying that figure by one hundred. The U.S. Census region is represented as three dummy variables for the South, West, and Midwest. The Northeast was left out of the regression equations as a reference due to its higher probability of being

developed. Lastly, the crude birthrate at time one (1990) was used in order to control for previous levels of fertility so that all effects of the determinants would be unbiased as to those levels.

### *3.3 Analytic Procedures*

The analytic strategy of this paper takes a multiphasic approach, which includes both statistical description and inferential explanation of the determinants of fertility in the U.S. at the county level. The initial descriptive phase is interested in the simple description of all non-dummy coded variables in the study via measures of central tendency and variation for the entire country and then across the four Census defined regions. The second phase of the analysis includes two stages, with the first concerned with the bivariate relationship between the variables of interest via simple zero-order correlations. The second stage is concerned with the multivariate explanatory relationships of determinant specific OLS regression models on both the crude birthrate in 2010 and the difference in the crude birthrate from 1990-2010.

## **4. RESULTS**

### *4.1 Descriptive Results*

The results for the descriptive results are illustrated in Table 1. The results in this table show significant variation, both spatially and temporally. Of primary importance, is the variation in the dependent variable from 1990 to 2010. The overall crude birthrate fell by 1.6 children per 1,000 over the ten year period. This difference is large in magnitude when considering that the starting point was only 14.11 per 1,000. Also, this drop in the crude fertility rate is consistent across all four geographic areas, with the West seeing the largest drop and the Midwest seeing the smallest. These findings validate the purpose of this study as there is both a significant temporal change in the fertility rate from 1990 to 2010 and a good degree of spatial variation, both in terms of the crude birthrate and the regional specific difference in birthrates from 1990 to 2010.



**Table 1. Descriptive Statistics for Indicators of Development, by U.S. Region, 2010.**

			<b>Geographic Region: Mean (Standard Dev.)</b>				
			<u>U.S.</u>	<u>Northeast</u>	<u>Midwest</u>	<u>West</u>	<u>South</u>
<b>Indicators of Development</b>			(N=3,054)	(N=215)	(N=1,054)	(N=410)	(N=1,375)
Personal Income per Capita			17,092 (3,732.6)	20,403 (4,761.2)	17,363 (3,107.2)	18,050 (4,170.3)	16,081 (3,432.5)
(LN) Ecological Footprint			1.50 (.59)	1.63 (.63)	1.56 (.41)	2.12 (.71)	1.27 (.51)
% Urban			35.64 (29.16)	47.71 (29.84)	33.42 (28.45)	41.81 (32.37)	33.62 (27.86)
% > Level 1 Literacy Rate			80.49 (7.38)	84.13 (4.02)	84.97 (3.50)	83.78 (5.51)	75.51 (1.66)
Life Expectancy			76.31 (1.98)	77.54 (1.08)	77.30 (1.62)	77.50 (1.57)	75.02 (1.66)
<b>Fertility Measures</b>							
Age-Race Adjusted Birth Rate 1990			14.11 (2.95)	13.06 (1.76)	13.24 (2.69)	15.36 (3.79)	14.49 (2.78)
Age-Race Adjusted Birth Rate 2010			12.52 (2.57)	11.70 (3.12)	12.05 (2.24)	12.88 (3.17)	12.89 (2.42)
Birth Rate 2010 minus 1990			-1.6 (1.67)	-1.91 (2.77)	-1.19 (1.31)	-2.49 (1.82)	-1.60 (1.52)

The independent variables also show significant variation across geographic regions. First, the personal income per capita is highest in the Northeast and lowest in the South, with the national average being near \$17,092 per capita. Next, the human ecological footprint measurement is highest in the West and lowest in the South, with a national average of 1.50. This of course is not directly meaningful due to the fact that it was logged for all analytic procedures. The percent urban was expectedly highest in the Northeast and it was lowest in the Midwest, with the national average for all counties being 35.64%. The percent of individuals classified as not being in the level 1 literacy group was highest in the Midwest and lowest in the South, with the national average being 80.49% of individuals not being in the lowest category of function literacy. Lastly, the average life expectancy of a county was highest in the Northeast and lowest in the South, with the national average being 76.31 years of age. From these results, it is easy to see patterns arise in the more developed Northeast and the least developed south. These initial findings tend to support other previous literature on the variation of development within the U.S. by Census region.

#### 4.2 Bivariate Results

The results of the bivariate analysis can be seen in Table 2 as the results of the zero-order correlations between the dependent variables of interest and each of the independent variables. As one can see, all of the coefficients except one are statistically significant. This is not unexpected due to the large

size of the population of interest (N=3,054). That being said, the direction and magnitude of the coefficients is extremely interesting in this analysis. First, the percent of individuals not in the lowest level of functional literacy category decreases the fertility rate consistently across 1990 and 2010 as it increases. Also, as the percent increases the difference between 1990 and 2010 also increases, meaning that the drop in the fertility level is directly related to having a higher quality of educated individuals. However, also of interest, the other measures of development, both economic and socio-cultural, had reverse effects on the differences in the fertility rate change from 1990 to 2010 as in each case there is a negative association with the increase of each.

**Table 2. Correlation Coefficients by Indicators of Development, According to Fertility in U.S. Counties.**

Indicators of Development	Age-Race Adjusted Birth Rate		
	1990	2010	2010 minus 1990
% > Level 1 Literacy Rate	-.270***	-.269***	.062***
Life Expectancy	-.162***	-.234***	-.074***
Family Planning Center <1=yes>	.108***	.081***	-.065***
% Urban	.369***	.357***	-.100***
Personal Income per Capita	0.024	-.037*	-.098***
(LN) Ecological Footprint	.223***	.149***	-.165***

\*\*\* p-value = .000

\* p-value < .05

In relation to life expectancy, as the average expectancy increases the crude birth rate drops in both 1990 and 2010. Next, having a family planning center, a higher percent of the population classified as urban, and a higher ecological footprint are all associated with higher crude birthrates and less of a change from 1990 to 2010 in the crude birthrate. At first glance, these seem to be somewhat counter-intuitive results. However, considering that outside of the South each of these are associated with increases in the minority population and the above literature review, it is not as unexpected as first thought. Lastly, the increases in the personal income per capita are not significantly associated with the 1990 crude birthrate and decrease the 2010 crude birthrate.

#### 4.3 Multivariate Results

The final stage of this paper is concerned with the inferential explanation of the variation across counties in their crude birthrate in 2010 and their change in crude birthrate from 1990 – 2010. The technique used, as mentioned above, is a simple OLS nested model approach in which the two sets of variables (economic and socio-cultural) will be regressed on the dependent variable in separate models in order to allow for cross model comparisons. Furthermore, the models are nested so that the reduced models include the variables of interest only and the full model includes the same variables plus all controls.

The final models include two sets of variables, socio-cultural and economic, as well as relative control variables. These models are presented in a nested fashion in which the socio-cultural determinants are independently examined in Model 1, the economic determinants are independently examined in Model 2, both socio-cultural and economic variables are examined together in Model 3, and the full models (including all controls) are examined in Model 4. Furthermore, each of the models contains its own set of nested models in which the crude birthrate at time one (1990) is introduced as a control in the second run. This control allows for the examination of truly independent effects concerning all variables in the model without prior birthrate affecting the outcome.

The results for the models predicting the crude birthrate in the year 2010 are illustrated in Table 3. Model 1 shows that all socio-cultural variables significantly affect the crude birthrate in 2010, with the effect of literacy and life expectancy decreasing the fertility rate as they increase and the effect of having a family planning center significantly increases the crude birthrate. However, when the time one control is introduced, the effect of the family planning center is washed out and the effect of literacy reverses. Model 2 introduces the independent effects of the economic determinants on the crude birthrates in 2010. The percent urban is shown to significantly increase the birthrate as it increases, while the per capita income measure significantly decreases the crude birthrate as it increases. The ecological footprint associated with the human impact of the county is insignificant in its effect on the dependent variable of interest. However, when the time one control is introduced, all economic indicators are shown to be significant predictors with ecological footprint significantly decreasing the birthrate as it increased.

**Table 3. Regression Coefficients for 2010 Age-Race Adjusted Birthrates by Indicators of Socio-cultural and Economic Development**

	Model 1	Model 2	Model 3	Model 4
<b>Indicators of Development</b>				
<b>Socio-cultural Determinants</b>				
Literacy	-.198***	.031*	--	--
Life Expectancy	-.108***	-.122***	--	--
Family Planning Centers (dummy)	.087***	-.001	--	--
			0.024	.000
			0.204	.001
<b>Economic Determinants</b>				
Percent Urban	--	--	.435***	.123***
Per Capita Personal Income (LN)	--	--	-.216***	-.098***
Human Ecological Footprint	--	--	.029	-.058***
			.094***	-.037***
			.053*	-.028*
<b>Controls</b>				
Age-Race Adjusted Birthrate 1990	--	.814***	--	.796***
Percent Non-White	--	--	--	--
South	--	--	--	--
Midwest	--	--	--	--
West	--	--	--	--
				.783***
				--
				.079*
				.154***
				.114***
				.159***
Intercept (R-Square)	28.77(.08)	13.71(.69)	13.51(.17)	34.05(.25)
			3.86(.69)	13.58(.70)
				36.77(.26)
				14.93(.71)

\* p-value <= .05  
 \*\* p-value <= .01  
 \*\*\* p-value <= .001

Next, Model 3 introduces both the economic and socio-cultural variables, within the same model. The results show that, even when controlling for the economic variables the same socio-cultural variables are significantly related to the crude birthrate as both literacy and life expectancy decrease the crude birthrate as they increase. The results hold when the control for the time one birth rate is introduced. Within the same model, all of the economic determinants continue to be significant predictors in the face of the socio-cultural variables. The results show that they all still affect the birthrate in the same manner as in Model 2.

Lastly, Model 4 introduces all region dummies and the percent non-white as controls. The final results in the full model show that the only socio-cultural determinant that stays significant in the face of all controls is life expectancy, which still significantly decreases the crude birthrate in 2010 as it increases. All economic determinants remain significant predictors in the full model, with the percent urban and the per capita income increasing the birthrate while the ecological footprint decreases the birthrate as it increases. Also of interest, the percent non-white in the county has no significant effect on the birthrate. Finally, when controlling for the geographic region only the Midwest is significantly different from the Northeast (reference) as it has a higher crude birthrate.

The results for the models predicting the differences in the crude birthrate from 1990 to 2010 are illustrated in Table 4. Again, Model 1 shows the socio-cultural variables that significantly effect the difference in the crude birthrate from 1990 - 2010, with the effect of literacy increasing the difference from time one to time two as it increases and life expectancy decreasing the difference in the fertility rate as it increases. Also, the effect of having a family planning center significantly increases the crude birthrate. However, when the time one control is introduced, the effect of the family planning center is washed out but the effect of literacy and life expectancy remain. Model 2 introduces the independent effects of the economic determinants on the difference in crude birthrates from 1990 - 2010. The per capita income measure and the human ecological footprint both significantly decrease the difference as they increase. The percent urban is insignificant in its effect on the dependent variable of interest. However, when the time one control is introduced, all economic indicators are shown to be significant predictors with the percent urban increasing the difference significantly as it is increased.

**Table 4. Regression Coefficients for Difference in Age-Race Adjusted Birthrates from 1990-2010 by Indicators of Socio-cultural and Economic Development.**

	Model 1	Model 2	Model 3	Model 4
<b>Indicators of Development</b>				
<b>Socio-cultural Determinants</b>				
Literacy	.192***	.048*	--	.013
Life Expectancy	-.197***	-.188***	--	-.192**
Family Planning Centers (dummy)	.055**	-.001	--	.002
<b>Economic Determinants</b>				
Percent Urban	--	--	-.022	.185**
Per Capita Personal Income (LN)	--	--	-.070***	-.071**
Ecological Footprint	--	--	-.149***	-.043**
<b>Controls</b>				
Age-Race Adjusted Birthrate 1990	--	-.511***	--	-.545**
Percent Non-White	--	--	--	-.011
South	--	--	--	.024
Midwest	--	--	--	.147***
West	--	--	--	-.108***
Intercept (R-Square)	13.72(.27)	13.72(.27)	13.58(.29)	14.93(.31)

\* p-value <= .05  
 \*\* p-value <= .01  
 \*\*\* p-value <= .001

Next, Model 3 introduces both the economic and socio-cultural variables within the same model as in Table 3 in order to test whether or not there are effects while controlling for all determinants. The results show that, even when controlling for the economic variables, the same socio-cultural variables are significantly related to the difference in crude birthrates. Literacy, again, significantly increases the difference while life expectancy still significantly decreases the difference. The results hold when

the control for the time one birth rate is introduced. Within the same model, all of the economic determinants continue to be significant predictors in the face of the socio-cultural variables when the time one control is introduced. The results show that they all still affect the birthrate in the same manner as in Model 2, in terms of direction.

Lastly, Model 4 introduces all region dummies as controls. The final results in the full model show that the only socio-cultural determinant that stays significant in the face of all controls is life expectancy, which still significantly decreases the difference in the crude birthrate from 1990 - 2010 as it increases. All economic determinants remain significant predictors in the full model, with the ecological footprint and the per capita income decreasing the difference in the birthrate temporally, while the percent urban increases the difference over time birthrate as it increases. Again, the percent non-white in the county has no significant effect on the difference in crude birthrates over the ten year period. Finally, when controlling for the geographic region only the Midwest is significantly different from the Northeast (reference) as it has a larger difference in crude birthrates over the specified time period.

## 5. DISCUSSION and CONCLUSION

As the earlier review of the literature alludes to, the implications for understanding the determinants of fertility are of immense importance. The simple understanding of how lower levels of fertility are achieved and maintained over an extended period of time could potentially prove useful in a number of policy-related initiatives. While most of the existing literature is interested in the fertility level at a national level, this paper hopes to shed some light on the sub-national effects of both economic and socio-cultural determinants as proxies of development and their direct effects on the fertility of U.S. counties. The results are pretty clear and suggest that both sets of determinants play a role to some degree.

However, it is also important to note that, in the U.S., the economic development is clearly more important. That is not to say that the socio-cultural development of a given county is not important, because it surely is, but the economic indicators stay significant across all models and even in the face of controlling for socio-cultural variables in Models 3 & 4. Again, the percent of the population urban, the income per capita, and the human impact variable all prove to be determining factors in human fertility behaviors. Both the human impact and the personal income per capita are direct measures of economic well-being and material development, and both significantly result in lower fertility as they increase.

The percent urban is also associated with economic development, especially of Metropolitanization. However, this variable actually increases the fertility rate significantly across all models, which is counterintuitive to the hypothesis that development leads to lower fertility. A possible explanation from the literature review could be a higher proportion of non-whites, but the results stand even while controlling for the percent of the population in the county that is classified as non-white. Another potential explanation, from the migration and urbanization effect of the demographic transition, could be that cities attract young families looking to find work and start careers. In relation, this is also the time in their lives when they are most likely to have children (young adulthood). This explanation is developed and widely supported by demographic literature on the migration tendencies of individuals at differing stages of the life course. Regardless of direction, as hypothesized, it is evident that the economic indicators are most influential, based on the international trends of western countries.

This is not to say that the socio-cultural determinants are not of import because, as the models show, they most definitely are. However, all but one, life expectancy, becomes non-significant when controlling for the economic determinants, which holds strong across all models and proves to be associated with a decrease in the crude birthrate as it increases. Again, this finding stands while controlling for economic determinants, meaning that the role of average life expectancy is not directly related to those indicators. Furthermore, life expectancy is often related to areas of high cultural development, which privilege exercise, diet and, it seems smaller families. That being said, there are several limitations to this study related to the overall design and analysis. First, most of the variables were taken from Cutright's 1983 study analyzing economic versus socio-cultural determinants of sub-national fertility trends in the U.S. Therefore, there may be other more appropriate indicators that would serve as better predictors in either case. However, Cutright does make validating arguments for the use of each. Also, the regional variation identified in the descriptive stage of the analysis, accompanied by much of the literature, leads one to believe that there are potentially non-random spatial patterns associated with the fertility level. If that is indeed the case, then it would provide a special circumstance in which future studies could implement Exploratory Spatial Data Analysis and spatial regression techniques. This would allow for the control of non-random variation across space and may lead to a somewhat clearer picture of the effects of the determinants of interest.

Lastly, as most of the research has shown, indicators of economic and cultural development are directly related to declines in fertility. However, it is also obvious from that literature that, at least at the national level, there is no single pattern to low fertility taken by all countries. At the sub-national level the findings of this paper support the multiple pattern theory, while at the same time suggesting a dominance of economic development in comparison to socio-cultural development. Perhaps this is directly related to the fact that the U.S. is one of the nations most developed countries and there may be a sort of ceiling effect.

Nevertheless, these results seem to be useful in understanding the effects of development on the rate of fertility within the U.S. For policy makers it is evident that, in order to control the fertility rate, one must implement strategies that aim at economically developing an area. At the same time, it is important to give new opportunities to all individuals within economically developing areas in order to control fertility across all populations. Failure to adequately do so would result in population-specific fertility patterns, which would potentially only drive levels of inequality upward and lead to an increasing set of social ills.

## **REFERENCES**

- d'Addio, Anna Cristina and Marco Mira d'Ercole, "Trends and Determinants of Fertility Rates in OECD Countries: The Role of Policies". <http://www.oecd.org/dataoecd/7/33/35304751.pdf>.
- Becker, Gary S. 1960. "An Economic Analysis of Fertility." *Demographic and Economic Change in Developed Countries*. Princeton, NJ: Princeton University Press.
- Behrman, Jere and Paul Taubman. 1989. "A Test of the Easterlin Fertility Model Using Income for Two Generations and a Comparison with the Becker Model." *Demography*, 26:1:117-123.
- Blake, Judith. 1968. "Are Babies Consumer Durables?" *Population Studies*, 22:5-25.
- Bloom, David E. 1982. "What's Happening to the Age at First Birth in the United States? A Study of Recent Cohorts." *Demography*, 19: 351-370.
- Bongaarts, John and Susan Cotts Watkins. 1996. "Social Interactions and Contemporary Fertility Transitions." *Population and Development Review*, 22: 639-682.



- Bongaarts, John. 2002. "The End of the Fertility Transition in the Developed World." *Population and Development Review*, 28: 419-443.
- Bongaarts, John (Population Council). 2005. "Demographic Trends." Prepared for the David and Lucile Packard Foundation Population Program Review Task Force. August, 2005.
- Bumpass, Larry and Sara McLanahan. 1989. "Unmarried Motherhood: Recent Trends, Composition and Black-White Differences." *Demography*, 26: 279-286.
- Cleland, John and Chris Wilson. 1987. "Demand Theories of the Fertility Transition: an Iconoclastic View." *Population Studies*, 41: 5-30.
- Caldwell, John C. 1986. "Routes to Low Mortality in Poor Countries." *Population and Development Review*, 12:171-220.
- Caldwell, John C., I.O. Orubuloye and Pat Caldwell. 1992. "Fertility Decline in Africa: A New Type of Transition?" *Population and Development Review*, 18:211-242.
- Caldwell, John C., Barkat-E-Khuda, Bruce Caldwell, Indrani Pieris, and Pat Caldwell. 1999. "The Bangladesh Fertility Decline: An Interpretation." *Population and Development Review*, 25:67-84.
- Coale, Ansley and S.C. Watkins. 1986. *The Decline of Fertility in Europe: The Revised Proceedings of a Conference on the Princeton European Fertility Project*. Princeton, N.J.: Princeton University Press.
- Cutright, Philips. 1983. "The Ingredients of Recent Fertility Decline in Developing Countries." *International Family Planning Perspectives*, 9:4:101-109.
- Davis, Kingsley. 1963. "The Theory of Change and Response in Modern Demographic History." *Population Index*, 29:345-366.
- Demeny, Paul. 1986. "Population and the Invisible Hand." *Demography*, 23:473-487.
- Easterlin, Richard. 1978. "What Will 1984 Be Like? Socioeconomic Implications of Recent Twists in Age Structure". *Demography*, 15:4: 397-432.
- Knodel, John and Etienne van de Walle. 1979. "Lessons from the Past: Policy Implications of Historical Studies." *Population and Development Review*, 5:217-245.
- Haines, Michael R. and David Hacker. 2006. "The Puzzle of the Antebellum Fertility Decline in the U.S.: New Evidence and Reconsideration." NBER (National Bureau of Economic Research), October 2006. [www.nber.org/papers/w12571](http://www.nber.org/papers/w12571).
- Hofferth, Sandra L. 1984. "Long Term Economic Consequences for Women of Delayed Childbearing and Reduced Family Size." *Demography*, 21(2):141-155.
- Hogan and Kitagawa. 1985. "The Impact of Social Status, Family Structure and Neighborhood on Fertility of Black Adolescents." *American Journal of Sociology*, 90:825-855.

- IUSSP (International Union for the Scientific Study of Population). 2001. "International Perspectives on Low Fertility: Trends, Theories and Policies." Organized by the IUSSP Working Group on Low Fertility in Collaboration with the National Institute of Population and Social Security Research (Japan). March 21-23, 2001.
- Kahn, Joan. 1988. "Immigrant Selectivity and Fertility Adaptation in the United States." *Social Forces*, 67 (1): 108-128.
- Kirk, Dudley and Bernard Pillet. 1998. "Fertility Levels, Trends and Differentials in Sub-Saharan Africa in the Late 1980s and 1990s." *Studies in Family Planning*, 29:1:63-82.
- Knodel, John, Napaporn Havanon and Anthony Pramualratana. 1984. "Fertility Transition in Thailand: A Qualitative Analysis." *Population and Development Review*, 10:297-328.
- Lesthaeghe, Ron L. and Lisa Neidert. 2001. "The 'Second Demographic Transition' in the U.S.: Spatial Patterns and Correlates." Population Studies Center Research Report No. 06-592, March 2006. <http://www.psc.isr.umich.edu/pubs/abs.html?ID=4052>.
- Mason, Karen O. and Karen Kuhlthau. 1992. "The Perceived Impact of Child Care Costs on Women's Labor Supply and Fertility." *Demography*, 29(4): 523-544.
- Mason, Karen Oppenheim. 1997. "Explaining fertility transitions." *Demography*, 34: 443-454.
- Menken, J. 1985. "Age and Fertility: How Long Can You Wait?" *Demography*, 22:4:469-483.
- Preston, Samuel. 1984. "Children and the Elderly: Divergent Paths for America's Dependents." *Demography*, 21:435-457.
- Rindfuss, Ronald R., Karin L. Brewster and Andrew A. Kavee. 1996. "Women, Work and Children: Behavioral and Attitudinal Change in the U.S." *Population and Development Review*, 22:3:457-482.
- Schoen, Robert, Young J. Kim, Constance A. Nathanson, Jason Fields, Nan Marie Astone. 1997. "Why Do Americans Want Children?" *Population and Development Review*, 23:2:333-358.
- Trussell, James. 1988. "Teenage Pregnancy in the United States." *Family Planning Perspectives*, 20:6: 262-272.
- Vallin, Jacques. 2002. "The End of the Demographic Transition: Relief or Concern?" *Population and Development Review*, 28:105-120.
- Weeks, John R. 2000. *Population: An Introduction to Concepts and Issues 9th Ed.* Belmont, CA: Wadsworth/Thompson Learning.
- Westoff, Charles and Akinrinola Bankole. 2000. "Trends in the Demand for Family Limitation in Developing Countries." *International Family Planning Perspectives* 26:56-62.
- Wu, Lawrence. 1996. "Effects of Family Instability, Income, and Income Instability on Risk of Premarital Birth." *American Sociological Review*, 61: 386-40.