A CROSS-NATIONAL ANALYSIS OF THE EFFECTS OF FAMILY PLANNING AND DEVELOPMENT ON FERTILITY DECLINE IN DEVELOPING NATIONS

by

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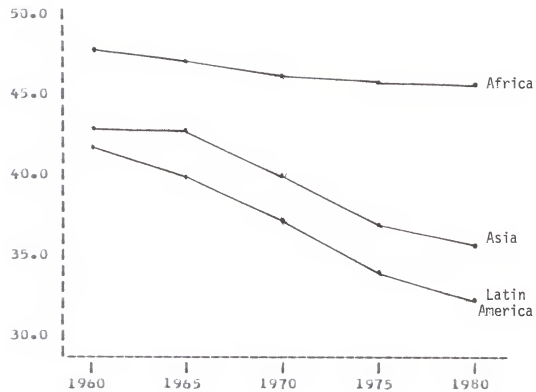
Chapter One

INTRODUCTION

INTRODUCTION

Over the past two decades, demographers have noted a decline in fertility rates for many developing nations (United Nations, 1983). Two competing explanations have emerged to account for fertility decline: the Innovation/Diffusion model and the Adjustment model (Carlsson, 1966). The Innovation/Diffusion model stresses the importance of modern contraception and family planning. The Adjustment model, on the other hand, emphasizes the role of structural development in reducing fertility (Carlsson, 1966). This thesis represents an attempt to shed additional light on these two alternative explanations of fertility decline in developing nations. This chapter is organized into four sections: (1) discussion of fertility decline in developing nations; (2) statement of purpose; (3) statement of significance; and (4) summary and overview.

Figure 1. Declines in Crude Birth Rates 1960-1980 For Africa, Asia, and Latin America.



Source: World Bank. 1983. World Tables, 3rd ed. Volume II. Social Data. Johns Hopkins University Press: Baltimore

Table 1. Regional and Sub-Regional Crude Birth Rates 1960-1980 for Latin America, Asia, and Africa.

	CBR 1960	CBR 1970	CBR 1980	Decline 1960-1980
Latin America	42.0	36.7	32.6	-9.4
Central America	47.3	43.0	38.5	-8.8
Tropical South	45.4	38.9	33.5	-11.9
Temperate South	27.4	23.5	22.0	-5.4
Caribbean	36.0	32.0	29.0	-7.0
Asia	44.4	41.3	39.6	-4.8
East	38.7	28.3	20.3	-18.4
East South	43.6	38.4	32.8	-10.8
West South	45.5	42.8	40.0	-5.5
Middle South	46.3	43.7	39.9	-6.4
Africa	48.0	46.8	46.4	-1.6
East	50.0	48.5	48.2	-1.8
West	49.6	48.7	48.3	-1.3
North	48.3	45.3	43.1	-5.2
South	44.5	44.2	44.2	-0.3
Middle	43.0	43.0	43.2	+0.2

Source: World Bank. 1983. World Tables, 3rd ed. Volume II. Social Data. Johns Hopkins University Press: Baltimore.

FERTILITY DECLINE IN DEVELOPING NATIONS

Over the past two decades, fertility rates in developing countries have been declining as reported in Table 1 and Figure 1. The average crude birth rate (CBR) in developing countries in 1960 was 44.4 births per 1,000 persons. By 1970, the average CBR had declined to 41.3, and by 1980 it had declined to 38.4 births per 1,000 persons (World Bank, 1983). While fertility rates of developing countries have continuously declined since 1960, Latin America, Asia, and Africa have experienced differential rates of fertility decline.

Latin America has experienced the greatest decline in fertility over the past two decades. During the 20 year period of 1960-1980, fertility declined by 9.4 births per 1,000 persons. The greatest decline occurred between 1965 and 1970 when the birth rate dropped from 40.3 to 36.7 births per 1,000 persons. The slowest decrease occurred during the 1960-65 time period, when birth rates fell by only 1.7 births per 1,000 persons.

Asia experienced the second greatest decline in fertility. Between 1960 and 1980, the CBR in Asia fell by 4.8 births per 1,000 persons. There was no real decline from 1960 to 1965. The most rapid decrease in the birth

rate occurred during the 10 year period of 1965 to 1975 when fertility declined from 43.1 to 37.8 births per 1,000 persons. The periods of 1965-70 and 1970-75 experienced decreases in birth rates of 2.6 and 2.7 births per 1,000 persons respectively. During the period 1975-1980 the fertility decline slowed, the birth rate decreased by only 1.5 births per 1,000 persons.

Africa experienced the lowest decline in fertility. The CBR declined during 1960-1980 by 1.6 births per 1,000 persons. The largest decline occurred between 1965 and 1970 when the birth rate fell from 47.5 to 46.8 births per 1,000 persons, a drop of 0.7 births. The smallest change in the region's fertility was 0.1 births per 1,000 persons during 1975-1980.

STATEMENT OF PURPOSE

Two alternative explanations have emerged to account for fertility decline in developing nations: the Innovation/Diffusion and Adjustment models (Carlsson, 1966). The general purpose of this thesis is to examine the validity of these two alternative explanations of fertility decline. In more specific terms, the purpose of the thesis is threefold: (1) to formalize the two theoretical models; (2) to summarize existing research findings bearing on

these two models; and (3) to present results of an empirical test of the two alternative models for a sample of developing nations.

Formalize theoretical arguments. Discussion of the two theoretical models is dispersed throughout the literature in a random fashion. This thesis presents a formalized summary of the two theoretical models.

Summarize existing research. Existing empirical research examining these two models, whether singularly or simultaneously, is diverse. Research has been undertaken at both the sub-national and cross-national levels. This thesis presents a summary of the results of the sub-national and cross-national research that has tested both models simultaneously.

Empirical test of the two alternative models. Results of cross-national simultaneous tests of the alternative models of Innovation/Diffusion and Adjustment differ somewhat, though results tend to suggest support for both models (e.g., Cutright, 1983; Mauldin and Berelson,1978; Tsui and Bogue, 1978). This research is characterized by various shortcomings. For instance, several researchers have failed to control adequately for several important variables (Hernandez, 1981a; 1984) Furthermore, previous researchers,

with few exceptions (Cutright, 1983), have not looked at the decline in national rates of fertility since the time period 1965-1975. This thesis contributes to this body of research by incorporating controls for several important variables in a cross-national test of the two competing models for the time period of 1970-1980.

STATEMENT OF SIGNIFICANCE

This thesis is significant for two reasons. Not only will it shed light on which of the two competing models best accounts for world fertility decline in developing countries during the time period of 1970-1980, it has implications for policy.

Theoretical significance. A large body of research has accumulated that assesses the two models. This thesis contributes to this body of research by presenting results of a cross-national test of the two alternative perspectives for a new time period. Specifically, results of the analysis provide the basis for assessing the validity of the two models.

Policy significance. The policy implications are fairly straight forward. The results of the analysis provide some understanding of the determinants of the fertility decline in developing nations. This in turn provides insight into

future policy directions for public investment.

SUMMARY AND OVERVIEW

This chapter examined the intent of this thesis. It began with a discussion of declining fertility in developing nations. Attention was then directed to a discussion of the purposes of the thesis. The chapter concluded with a discussion of the theoretical and policy significance of this thesis.

The remaining five chapters of the thesis are organized in the following manner. Chapter Two contains a summary of the two theoretical perspectives and previous empirical research. Chapter Three contains a discussion of the data and method employed in the analysis. The results of the analysis are presented in Chapter Four. Chapter Five concludes with a summary, a discussion of implications, and suggestions for future research.

Chapter Two

THEORETICAL BACKGROUND AND PREVIOUS RESEARCH

INTRODUCTION

As noted in Chapter One, two competing theoretical models have emerged to account for declining fertility rates in developing countries: the Innovation/Diffusion and Adjustment models. In turn, a large body of sub-national and cross-national aggregate research has accumulated that examines these two competing models. This chapter contains a summary of the two models and the existing research. The chapter is organized as follows: (1) discussion of competing theories; (2) examination of previous research; and (3) summary and conclusions.

TWO COMPETING THEORIES OF FERTILITY DECLINE

Innovation/Diffusion

The Innovation/Diffusion model attributes fertility decline to the invention and dissemination of birth control methods. Knowledge of this innovation diffuses nonuniformly on the basis of rural/urban differences, regional differences, class differences, etc.

The primary assumption of the Innovation/Diffusion perspective is that birth control represents a "recent invention, something essentially new in human culture" (Carlsson, 1966:150). Rogers and Shoemaker (1971:9) define an innovation as:

> ... an idea, practice, or object perceived as new by an individual. It matters little, so far as human behavior is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery. It is the perceived or subjective newness of the idea for the individual that determines his reaction to it. If the idea seems new to the individual, it is an innovation.

In fact, while evidence suggests that knowledge of contraceptive methods has existed for some time (Himes, 1936), there is little indication of the extent to which populations have had access to knowledge or utilized it in order to limit childbearing (cf. van de Walle and Knodel, 1980).

The key to the effect of contraception on fertility is in its diffusion. The diffusion of contraception is not assumed to occur simultaneously in all areas. Instead, it involves a series of lags and a trickle down effect based on, for example, differences in urbanization, regionality, and class.

The dissemination of contraceptive information and technology occurs most quickly in areas of high population concentration. Contraceptive information spreads most quickly in these areas. Only later does it penetrate into less densely populated regions.

The nonuniform nature of diffusion can be further complicated by regional differences. Some regions may be reached before others, or some may respond more quickly. This may be partly due to geography (Carlsson, 1966), and partly a result of cultural heterogeneity (van de Walle and Knodel, 1980). For example, language differences formed an effective barrier for diffusion in nineteenth century Western Europe (van de Walle and Knodel, 1980).

Class differentials also affect the diffusion of innovations. Carlsson maintains that the middle class more readily accepts innovations such as birth control (1966:150). In time, contraceptive use trickles down to the working classes and the agricultural sector.

Today, family planning programs are a major factor affecting the diffusion of the innovation of modern contraceptive practices. By distributing contraceptive technology, services, and family size limitation information, networks of clinics bolster the diffusion

process. These programs make information and supplies available which would have otherwise taken much longer to spread throughout the population. By supporting the diffusion of modern contraception, family planning programs function to reduce aggregate fertility. In effect, the greater the family planning commitment of a nation, the lower the aggregate fertility rate.

Adjustment

The Adjustment model stresses the importance of structural development on individual behavior. Fertility decline occurs as individuals' motivations for having large families change. The decline is not seen as being the specific consequence of the development of contraception. Rather, knowledge of various forms of birth control has existed throughout history and it has been used when the motivation existed to do so (Cowgill, 1975; Davis, 1984; Hammond and Jablow, 1976; Hassan, 1973; Polgar, 1972).

The primary assumption of the adjustment model is that "birth control, and especially contraception, need not be regarded as new or recent in human society" (Carlsson, 1966:150). Himes (1936) provides evidence suggesting that primitive peoples knew how to limit fertility. Some of the methods employed included abstinence, coitus interuptus,

extra-vaginal intercourse, use of douches, rhythm, tampons, homosexual intercourse, abortion, and infanticide (cited in Davis, 1984:13). Childbearing was also regulated by controlling the fertility of certain individuals, for example, single girls, widowed women, religious personnel, and lactating women (Davis, 1984:13). Special occasions for sexual abstinence also functioned to control fertility. These occasions included wars or hunting (Ford, 1964:28-29), the post partum period (Saucier, 1972), ceremonies, economic undertakings, deaths and births (Hammond and Jablow, 1976:52).

Decisions regarding the number of children a couple has or will have are influenced by the prevailing social conditions. Changes in motivation to limit fertility are therefore in response to societal development. The perceived costs of children increase as development occurs. Freedman notes:

> changes in the macro-developmental variables resulted in a shift from major dependence on relatively self-contained local institutions to dependency on larger social, economic, and political units. Such a shift implies a change in the division of labor from one in which the family and community are central to a larger complex in which the family gave up many functions to larger, specialized institutions (1979:2).

New opportunities associated with the new expanding systems lead to higher aspirations for children (King, 1974:54). New benefits are "more likely to be derived from investing in fewer children" (Freedman, 1979:2). As a result, individuals are motivated to limit family size.

The impact of structural development on aggregate fertility comes in the form of a reduced motivation for large families. Increases in educational opportunities, improved health and economic conditions, and changes in the roles for women increase the costs associated with large numbers of children. This, in turn, encourages smaller families. Only after sufficient motivation has been generated are any means of family size limitation utilized by members of a population. As Davis (1984:13) asserts "about all a program of contraception can do is satisfy a demand quickly once that demand gets underway." In effect, the greater the structural development of a nation, the lower the aggregate fertility rate.

PREVIOUS EMPIRICAL RESEARCH

A large body of sub-national and cross-national aggregate research has accumulated that examines these two competing models of fertility decline. This body of research includes singular as well as simultaneous tests of the two models.

Results of sub-national and cross-national simultaneous tests of the two models are reviewed in this chapter.

Sub-National Research

This subsection summarizes the results of recent sub-national research. While single tests of the two models exist and provide some support for each model (e.g., King et al., 1974; Ravenholt and Choa, 1974; Srikantan, 1977; Brackett et al., 1978), only recent studies that have simultaneously tested both models are reviewed.

Taucher and Bocaz (1978) analyzed the impact of five development measures and one measure of family planning program commitment on the gross reproduction rate (GRR) for 25 provinces in Chile during the years of 1960 and 1970. Of the development measures, illiteracy was associated with high fertility while the economic activity of women was associated with lower fertility. When these two measures were taken into account, neither the family planning measure nor other measures of development accounted for significant changes in the GRR.

Fertility change for circa 1972-1975 in the Republic of Korea was analysed by Foreit et al. (1980) and Kim et al (1982). One hundred and twenty-eight of the 138 rural counties were included in an analysis of the effects of

public and private sector family planning activities and development variables (such as T.V. sets per 100 households, child mortality and education) on fertility change. Results indicate that the development variables accounted for a larger proportion of the variance in fertility decline than availability of family planning whether from private or public sources.

Fertility in 37 of the 45 districts of Pakistan was analysed by Rukanuddin et al. (1984). Change in the number of children under age 5 per 1,000 married women of reproductive age (MWRA) was examined for the time period circa 1967-1972. The analysis included some common development variables such as urbanization, education, agricultural employment, literacy and marriage rates. Rudkanuddin et al. (1984) employed multiple measures of family planning, including measures such as the number of personnel and the amount of expenditures. Findings revealed that family planning program variables did not significantly affect fertility. Rather, education and literacy were more highly associated with fertility reductions.

Devendra (1984) employed a cross-sectional research design to examine the impact of family planning and development on fertility for 22 districts in Sri Lanka.

Development variables included measures such as infant mortality and marriage rates, female school enrollment and number of maternity beds per 1,000 married women of reproductive age. Only one family planning program measure was included in the analysis. The results revealed that while development and family planning together accounted for 84% of the total variation in fertility, family planning contributed only marginally to this total.

Ochoa (1984) employed a cross-sectional design in an examination of the total fertility rate (TFR) in 22 Colombian states for circa 1973. Both public and private family planning program acceptance rates were used to measure family planning. The development variables included access to public utilities, urbanization, female literacy, and proportion married. Three variables accounted for 84% of the variation in the TFR. Of the three variables, two development variables (access to public utilities and urbanization) had the greatest impact, while public family planning program acceptance was only marginally associated with lower fertility.

Srikantan (1977) examined the impacts of family planning and development on fertility reduction by undertaking a variety of analyses. These included a sub-national analysis

of the states of India, and a longitudinal analysis of Taiwan's family planning program. In both cases Srikantan found that both development and family planning had "independent and about equal impacts" on fertility decline (1977:233).

In sum, there exists some variation in the findings of sub-national studies which have simultaneously tested both models. Results, however, generally indicate support for the Adjustment model (Taucher and Bocaz, 1978; Foreit et al.,1980; Kim et al.,1982; Cabrera and Navarro, 1982; Rukanuddin et al., 1984; Devendra, 1984). However, Srikantan (1977) found support for both models in that development and family planning had comparable impacts on fertility decline. Hernandez (1981a) attributes this finding to biases in Srikantan's sample. Specifically, he argues that self selection involved in the small samples employed by Srikantan resulted in the overestimation of the impact of family planning.

The sub-national research is characterized by several shortcomings (e.g., Hernandez, 1984; Sherris et al., 1985). Most importantly, this research does not provide the basis for assessing the validity of the two models beyond individual nations. Cross-national research does provide the

basis for assessing the validity of the two models beyond individual nations.

Cross-National Research

This sub-section summarizes the results of the recent cross-national research. While single tests of the two models provide support for each model (e.g., Adelman and Morris, 1966; Ekanem, 1972; Friedlander and Silver, 1967; Janowitz, 1971; Ravenholt and Chao, 1974; Brackett et al., 1978), only recent studies that have simultaneously tested both models are reviewed.

Tsui and Bogue (1978) analyzed changes in fertility rates from circa 1965 to 1975 for 89 developing countries. Development measures included per capita GNP, urbanization, infant mortality, female agricultural employment, and female school enrollment. The Family Planning Effort Scale developed by Lapham and Mauldin (1972) was used as a measure of family planning (for a description of this scale see Lapham and Mauldin, 1972:29-40; Mauldin and Berelson, 1978:102-3). Results of the analysis indicated that family planning had a stronger effect on fertility decline than development.

In their analysis of 94 developing countries, Mauldin and Berelson (1978) examinded CBR changes between 1965 and 1975.

Seven development variables (per capita GNP, infant mortality, urbanization, male non-agricultural employment, education, life expectance and adult literacy) and the Family Planning Effort Scale were included in the analysis. The results indicated that while family planning had a greater effect on fertility decline than development, the combined effect of family planning and development accounted for a sizable proportion of the variation in fertility decline.

Tolnay and Christenson (1984) examined the impacts of family planning and economic development on changes in crude birth rates between the years 1965 and 1975. Data from 65 developing countries were used in the analysis. The Family Planning Effort Scale was used as a measure of family planning commitment. Development measures included per capita GNP, urbanization, infant mortality, and school enrollment. Estimates indicated that family planning had a strong direct impact on fertility decline, while various development measures had little direct effect on fertility decline. However, the indirect effects of several development variables were substantial.

Using both Mauldin and Berelson's (1978) and Tsui and Bogue's (1978) data, Hernandez (1981a; 1984) examined

fertility changes between the years of circa 1965 and 1975 The sample consisted of 83 developing countries. In an attempt to more adequately assess the true impact of family planning, Hernendez included several controls for country characteristics such as island status and population density in the analysis. Results indicated that the inclusion of these variables substantially reduced the independent effect of family planning on fertility decline.

Cutright (1983) examined fertility decline between 1960 and 1980 for 83 developing countries. Development variables included per capita GNP, education, life expectancy, and urbanization. The Family Planning Program Effort Scale developed by Lampham and Mauldin (1972) was used to measure family planning commitment. In order to maintain comparability among nations in the sample, Cutright omitted from his analysis those nations which had populations of less than one million. Results indicated that both family planning and development were important in explaining reductions in fertility. Of the development variables, life expectancy and literacy were found to be the most important.

In sum, most studies provide some support for the two models. Hernandez (1981a; 1984), however, maintains that several researchers have overestimated the unique impact of

family planning on fertility decline because they failed to control for such variables as island status and population density. In turn, with one exception (Cutright, 1983), existing cross-national studies have been confined to the time period of 1965-1975. No cross-national study has simultaneously tested the two models for the time period of 1970-1980 and included controls for several variables indentified as important by Hernandez (1981a; 1984).

SUMMARY AND CONCLUSIONS

This chapter examined the two competing theoretical models of Innovation/Diffusion and Adjustment and the findings of previous sub-national and cross-national research. Results of the sub-national research which has simultaneously tested both models generally provide support for the Adjustment model. However, this research does not provide the basis for assessing the validity of the two models beyond individual nations.

Cross-national research does provide the basis for assessing the validity of the two models beyond individual nations. Findings of existing cross-national research tend to support both models. Hernandez (1984) notes that several studies have overestimated the effect of family planning on fertility decline because several important variables were

not controlled. Additionally, with only one exception (Cutright, 1983), cross-national studies have only examined the time period of circa 1965-1975. This thesis provides an empirical test of the impact of family planning and development on fertilty decline, incorporating the concerns of Hernandez (1981a; 1984), for the time period of 1970-1980.

Chapter Three
DATA AND METHOD

INTRODUCTION

As noted in Chapter Two, previous cross-national tests of the two models are deficient in two ways: fertility decline has not been examined for the 1970-1980 time period, and important control variables such as population density and island status have been omitted from analysis (cf. Hernandez, 1981b; 1984). This thesis remedies these shortcomings by analyzing fertility decline for the 1970-1980 time period, incorporating population density as a control variable, and restricting the analysis to non-island nations.

This chapter summarizes the data and method employed in the empirical analysis of the relative impacts of family planning and development on fertility decline in developing nations. This chapter is organized into four sections: (1) discussion of the sample; (2) examination of the variables; (3) discussion of the method of analysis; and (4) summary.

SAMPLE

The sample consists of 59 developing nations. Only non-

Table 3. Nations included in the Sample (n=59).

Afghanistan	Malawi
Algeria	Malaysia
Angola	Mali
Argentina	Mauritania
Bangladesh	Mexico
Benin	Morroco
Bolivia	Nepal
Brazil	Nicaragua
Burma	Niger
Burundi	Nigeria
Chad	Pakistan
Chile	Panama
Columbia	Paraguay
Costa Rica	Peru
Dominican Republic	Rwanda
Ecuador	Saudi Arabia
El Salvador	Senegal
Ethiopia	Sierra Leone
Ghana	Syrian Arab Republic
Guatemala	Tanzania
Haiti	Thailand
Honduras	Togo
India	Tunisia
Iran	Uganda
Iraq	Upper Volta
Ivory Coast	Venezuela
Jordan	Yemen Democratic Republic
Kenya	Zaire
Korea, Republic	Zambia
Liberia	

island nations (defined as nations surrounded on all sides by water) with populations of more than one million for which data were available on all variables were included in the analysis. This sample is not a probability sample, but it is representative of developing nations. The nations included in the sample are presented in Table 3.

Island nations were excluded from the analysis for two reasons (Hernandez, 1984). First, island nations are small in size and are characterized by high population densities. This positively affects the implementation of family planning programs and development since the population is more easily accessible. Second, since islands are bounded on all sides by water, the land available to support a population is limited. This limitation could make more real the problems of overpopulation for both the individuals and leaders of the nation. Moreover, this realization could have spurred governments to invest more resources in fertility reduction policies than island nations.

VARIABLES

Dependent Variables

Two measures of fertility have been used in previous cross-national tests of the two models: the crude birth rate (CBR) and the total fertility rate (TFR) (e.g., Tsui and

Bogue, 1978, Mauldin and Berelson, 1978; Cutright, 1983; Hernandez, 1984; Tolnay and Christenson, 1984). The CBR measures the number of live births per 1,000 persons. The TFR measures the average number of children a woman will have when she reaches the end of her childbearing years. While the CBR does not control for the age composition of a population, it is a defensible measure of fertility when comparing nations with similar age structures (Cutright, 1984:103). In fact, Entwisle (1981) in a reanalysis of previous research found that there is no substantial difference between the results obtained from the use of the CBR or the TFR. Since the CBR is the most commonly used measure of fertility (e.g., Tsui and Bogue, 1978; Mauldin and Berelson, 1978, Hernandez, 1984), and to ensure comparability with previous studies, it was employed in the analysis.

There are two basic ways of calculating fertility change: the absolute change in fertility between two points in time and the percent change in fertility over time. Mauldin and Berelson (1978) found very little difference between fertility change measured as the percent change and the absolute difference between two points in time. Since the percent change in fertility is the most widely used variable (e.g., Mauldin and Berelson, 1978; Tolnay and Christenson,

1984), fertility change was measured as percent change in the CBR from 1970 to 1980. Data were obtained from the World Bank (1983:Social Data Sheet 1).

Independent Variables

Family planning. The Innovation/Diffusion model identifies family planning as the primary determinant of fertility decline. By facilitating the diffusion of contraceptive technology and information, family planning programs contribute to fertility decline (Mauldin, 1983; Mauldin and Berelson, 1978; Tolnay and Christenson, 1984; Tsui and Bogue, 1978).

Mauldin and Berelson (1978:102) define family planning programs as:

> ... organized efforts, typically governmental, to extend the effective practice of modern fertility control without direct or major efforts to affect socioeconomic determinants or the structure of demand.

The most widely used measure of national family planning commitment is the Family Planning Program Effort Scale developed by Lampham and Mauldin (1972). This additive scale consists of fifteen items (Mauldin and Berelson, 1978:102):

(1) Fertility reduction included in official planning policy;
(2) Favorable public statements by political

leaders;
(3) Contraception readily and easily available, publically and commercially throughout the country;
(4) Customs and legal regulations allow importations of contraceptives not manufactured locally;
(5) Vigorous effort to provide family planning services to all married women of reproductive age;
(6) Adequate family planning administration structure;
(7) Training facilities available and utilized;
(8) Full-time home-visiting fieldworkers;
(9) Postpartum information, education and service program;
(10) Abortion services openly and legally available to all;
(11) Voluntary sterilization services (male and female) openly and legally available to all;
(12) Use of mass media on a subtantial basis;
(13) Government provides subtantial part of family planning budget from its own resources;
(14) Record keeping systems for clients at clinic level and program service statistics;
(15) Serious and continuous evaluation effort.

Items are equally weighted and they are scored from 0 to 2 as follows: 0 = no effort; 1 = some effort; 2 = strong effort. Scale scores range from 0 to 30.

Two major criticisms of the Family Planning Program Effort Scale have emerged in the literature (Demeny, 1979a, 1979b; Hernandez 1981a). First, several of the scale items can be considered prerequisites to the implementation of family planning programs (items 4, 10, and 11) (Hernandez, 1984:119). Second, other scale items measure factors that follow fertility decline, rather than cause fertility

decline (items 1, 2, and 13) (Hernandez, 1984:119). As a result, the use of this scale may result in the overestimation of the impact of family planning on fertility decline (Hernandez, 1984:119).

Despite these shortcomings, the Family Planning Program Effort Scale is an internationally comparable index of family planning commitment. In turn, this scale has been widely used by cross-national fertility researchers (Tsui and Bogue, 1978; Mauldin and Berelson, 1978; Cutright, 1983), including its critics (Hernandez, 1981a; 1984). As a result, the Family Planning Program Effort scale was employed in the analysis. Data were obtained from Tsui and Bogue (1978: Appendix B).

Structural development. The Adjustment model stresses the role of structural development in the reduction of fertility. The impact of structural development on fertility decline comes in the form of reduced motivation for large families. In other words, increased economic, educational, and other opportunities increase the costs associated with having large families.

Structural development is generally viewed as consisting of components such as urbanization, economic development, education, and reduced mortality levels. Four items were

used to measure the four components. These included percent of population in urban areas, per capita GNP, percent of females enrolled in secondary school, and life expectancy. Each of these items are discussed below.

Urbanization is thought to have a positive effect on fertility decline and previous cross-national research supports this (e.g., Mauldin and Berelson, 1978; Tsui and Bogue, 1978; Cutright, 1983; Cochrane, 1983). The relationship between these two variables is explained by the lack of productive roles for children in urban areas. In rural areas, children perform a variety of activities needed by the family: caring for livestock, tending crops, child care, etc. In urban areas, the opportunities for children to contribute to the family are diminished. Subsequently, the rising costs associated with children create a propensity for smaller families (Easterlin, 1983: 57).

Urbanization was measured as the percent of the population living in urban areas according to local definition for circa 1970. Although this is not the ideal measure of urbanization, it is the only measure available for this time period. The data were obtained from the World Bank (1983: Social Data Sheet 1).

Economic development is thought to have a positive effect on fertility decline and previous cross-national research supports this (e.g., Mauldin and Berelson, 1978; Tsui and Bogue, 1978; Cutright, 1983). Economic development influences fertility decline by increasing living standards. Davis (1936, cited in Hernandez, 1984:11) suggests:

> ... individuals and families sought to take advantage of emerging economic opportunities, and to avoid relative loss of social and economic status compared to others who were also taking advantage of these opportunities, by responding with changes in demographic behavior that included limiting their family size. The result was sustained declines in aggregate fertility.

As a result of economic development, there is a shift in emphasis from the quantity of children to the quality of child care (Faruqee, 1979; Freedman, 1979; King, 1974).

Per capita gross national product (GNP) has become the accepted measure of economic development in cross-national research examining the effects of family planning and economic development on fertility (Faruqee, 1979; Mauldin and Berelson, 1978; Tolnay and Christenson, 1984). GNP per capita in 1970 was used to measure economic development. The data were obtained from the International Bank for Reconstruction and Development (1976) and the International

Labour Office (1977).

Educational level is thought to have a positive effect on fertility decline and previous cross-national research supports this (e.g., Mauldin and Berelson, 1978; Cochrane, 1983; Tolnay and Christenson, 1984). The nature of education's impact on fertility is via the perception of increasing costs associated with large numbers of children. Easterlin (1983:57) posits that education aids in the diffusion of new ideas which promote smaller families. Some of these could include images of lifestyles which compete with children or place a greater emphasis on the quality rather than the quantity of children. New ideas could also aid in the breakdown of traditions and norms surrounding the use of contraception. Increased education for females and the attendant employment opportunities also increase the opportunity costs associated with children. In addition, compulsory education for children functions to reduce the time available for family-related tasks (Easterlin, 1983:57).

Educational level has been measured in a variety of ways. The most commonly used measures are the literacy rate and school enrollment (cf. Faruqee, 1979). Literacy campaigns may teach people to read, but schools also teach ideas. This

is especially the case in secondary education. Cochrane (1979, 1983) and King (1974) present evidence indicating that female education is more highly correlated with fertility decline than male education. Consequently, education was measured as the percent of females (ages 12-19) enrolled in secondary school circa 1970. The data were obtained from the World Bank (1983: Social Data Sheet 1).

Life expectancy is thought to have a positive effect on fertility decline and previous cross-national research supports this (Tsui and Bogue, 1978; Cutright, 1983). Life expectancy was measured as the expected life span of an individual given the living conditions present at birth. The variable was measured in 1970. Data were obtained from the World Bank (1983: Social Data Sheet 1).

The mean correlation among the four items is .70. Each of the four items was standardized to zero mean and unit variance. An index was constructed by summing the standardized items and dividing by four. The Cronbach alpha for the index is .90.

Control Variable

Previous cross-national research has indicated that population density has an impact on fertility decline

(Hernandez, 1984). The importance of population density lies in its impact on the ability of a nation to reach the bulk of its population through family planning programs. For example, a nation with a sparsely distributed population must expend more resources to reach its population than a nation with a densely distributed population. As Hernandez (1984) has suggested, it is essential that this variable be controlled. Population density was expected to have a positive effect on fertility decline. It was measured as the population per square kilometer in 1970. This variable was logged to base 10 because it was skewed. Data were obtained from the World Bank (1983: Social Data Sheet 1).

METHOD OF ANALYSIS

The data were analyzed using ordinary least-squares regression (OLS). The percent change in the CBR beween 1970-1980 was regressed on the Family Planning Program Effort Scale (circa 1972) and the development index (1970), while controlling for population density (1970). The following equation summarizes the hypothesized effects of the variables on fertility decline:

$$Y = a + b1x1 + b2X2 + b3X3 + e$$

where,
Y = % decline in CBR for 1970-1980
a = intercept
b = coefficient to be estimated
X1 = Family Planning Program Effort Scale, 1972
X2 = Development Index, 1970
X3 = population density (log10), 1970
e = residual term

In order to assess the stability of the OLS estimates, several diagnostics were carried out. An auxiliary regression procedure was used to assess for multicollinearity. Moreover, residuals were examined for severe outliers.

SUMMARY

This chapter summarized the data and method used in the assessment of the effects of family planning commitment and structural development on fertility decline for the time period of 1970 to 1980. Specifically, three topics were discussed. First, the sample was identified. Second, dependent, independent, and control variables were discussed. And finally, the method of analysis was discussed.

Chapter Four
RESULTS OF THE ANALYSIS

INTRODUCTION

This chapter presents the results of empirical tests of the two competing theoretical models of fertility decline: the Innovation/Diffusion and Adjustment models. The chapter is divided into four sections: (1) examination of the bivariate results; (2) examination of the OLS regression estimates; (3) discussion of the findings; and (4) summary and conclusions.

BIVARIATE RESULTS

Table 3 contains the zero-order correlations between all variables used in the analysis. Consider first the correlations between the three explanatory variables. The correlations between the three explanatory variables are all small ($r<.5$). None of these correlations indicates a serious problem of multicollinearity.

As as additional check for multicollinearity, each of the three explanatory variables was regressed on the other two explanatory variables. Regression of the family planning scale on the other explanatory variables produced a

Table 3. Correlation Matrix for Family Planning, Development Index, Population Density and Percent Decline in CBR (1970-1980) (n=59).

	1.	2.	3.	4.
1. Percent Decline in CBR	---	.674	.535	.159
2. Family Planning		---	.487	.387
3. Development index			---	-.091
4. Population Density				---
Means	-.060	4.97	.009	1.35
Standard Deviations	.068	6.53	.885	.532

coefficient of determination of .425. Regression of the development index on the other two explanatory variables produced a coefficient of determination of .329. Regression of population density (log) on the other two explanatory variables produced a coefficient of determination of .252. Since none of the coefficients of determination approaches 1.0, multicollinearity is not a serious problem.

Turning attention to the correlates of the dependent variable, it appears that they are all related with fertility decline in the expected fashion. Fertility decline is positively associated with both family planning commitment (r=.674) and the development index (r=.535). The relationship betwen fertility decline and population density is positive, but quite weak (r=.159).

REGRESSION RESULTS

Full Sample. The percent decline in CBR between 1970 and 1980 was regressed on family planning, the index of development, and population density (log base 10) for the full sample. The results of the analysis are reported in Table 4.

Family planning has the expected positive effect on fertility decline. The unstandardized coefficient is more than twice the size of its standard error. Those nations

with high levels of family planning commitment experienced significant decreases in fertility for the 1970-1980 time period. This finding is consistant with previous research (e.g., Tsui and Bogue, 1978; Mauldin and Berelson, 1978).

The development index also has the expected positive effect on fertility decline. In turn, the unstandardized coefficient for this variable is more than twice the size of its standard error. The standardized coefficient indicates that the development index has less of an effect on fertility decline than family planning. Nonetheless, those nations with high levels of structural development experienced significant decreases in fertility for the 1970-1980 time period.

Population density has an unexpected negative effect on fertility decline. However, the unstandardized coefficient is not as large as its standard error. The effect of this variable on fertility change is minimal.

Reduced Sample. In order to assess the stability of the OLS estimates, the residuals were examined for outliers. The ten worst outliers were then deleted from the analysis and the model was reestimated. These included Thailand, Iran, Mauritania, Paraguay, Colombia, Mexico, Dominican Republic, Argentina, Peru, and Brazil. The results of the analysis of

Table 4. Results of the Regression of Percent Decline in CBR (1970-1980) on Family Planning, Development Index, and Logged Population Density (n = 59).

Regressor Variable	Percent Decline CBR, 1970-1980		
	Unstandardized Coefficient (b)	Standard Error	Standardized Coefficient (B)
Family Planning	.0059*	.0013	.5619*
Development Index	.0197*	.0088	.2576*
Population Density	-.0045	.0138	-.0353
Constant	.0372*	.0177	
R2	.5109		

* denotes t-statistic > 1.96

the reduced data set are reported in Table 5.

The effect of family planning on fertility decline decreased somewhat when the outliers were deleted. However, the variable continued to have a strong positive effect on fertility decline, and the unstandardized coefficient is more than twice the size of its standard error. In turn, family planning appears to still have a greater effect on fertility decline than development. Those nations with high levels of family planning commitment experienced significant declines in fertility during the 1970-1980 time period.

The effect of the development index remained positive and the unstandardized coefficient is still more than twice the size of its standard error. The standardized coefficient, while still smaller than the coefficient for family planning, increased in size from .26 to .32. Those nations with high levels of development experienced significant declines in fertility during the 1970-1980 time period.

With the deletion of outliers, the effect of population density on the dependent variable became positive. This effect is in the predicted direction. The unstandardized coefficient, however, is only slightly larger than its standard error, suggesting that this variable has only a minimal impact on fertility decline.

Table 5. Results of the Regression of Percent Decline in CBR (1970-1980) on Family Planning, Development Index, and Logged Population Density (n = 49).

Regressor Variable	Percent Decline CBR, 1970-1980		
	Unstandardized Coefficient (b)	Standard Error	Standardized Coefficient (B)
Family Planning	.0048*	.0013	.4858*
Development Index	.0241*	.0093	.3248*
Population Density	.0137	.0136	.1163
Constant	.0108	.0179	
R2	.5433		

* denotes t-statistic > 1.96

DISCUSSION

The results of the analysis can be summarized as follows:

a) Family planning commitment had a strong and significant positive effect on fertility decline. The effect of this variable was stronger than the effect of development. The effect of this variable remained significant but was reduced slightly when outliers were deleted from the analysis. Results provide support for the Innovation/Diffusion model of fertlity decline.

b) Development also had a strong and significant positive effect on fertility decline. The effect of development increased slightly when outliers were deleted from the analysis, but the effect of this variable still remained less than the family planning variable. Results provide support for the Adjustment model of fertility decline.

c) Population density did not appear to have an important effect on fertility decline, for the estimated effects of this variable were very weak for both analyses. In turn, the effects of population density were unstable since the direction of the effect of this variable differed for the two analyses.

The major conclusion to be drawn from the analysis is that support exists for both models of fertility decline. It appears, however, that family planning commitment is a more important determinant of fertility decline than level of development. Despite their differential contributions, both models help explain the decline in fertility for the sample of developing nations during the time period of 1970-1980.

SUMMARY AND CONCLUSIONS

The results of the empirical tests of the two competing models of fertiltiy decline were presented in this chapter. Percent decline in CBR (1970-1980) was regressed on family planning and structural development, while controlling for the effect of population density. Regression estimates were made using both the full sample and a sample with the ten worst outliers in the residuals deleted. Results of both anayises indicated that family planning and development had significant and positive effects on fertility decline. Population density, on the other hand, had very little effect on fertility decline. In sum, results suggest support for both models of fertility decline; however, the effect of family planning was stronger than the effect of development. This latter finding suggests that family planning was a more important determinant of fertility decline for the sample of nations during the 1970-1980 time period.

Chapter Five

SUMMARY AND CONCLUSIONS

INTRODUCTION

This chapter has three purposes. First, a summary of the thesis is presented. Second, the theoretical and policy related implications are examined. And finally, several suggestions are made about directions for future reseach.

SUMMARY OF THE THESIS

The purposes of the thesis were identified in Chapter One. These included (1) examination of the two theoretical models of fertility decline; (2) summarization of existing research bearing on these two models; and (3) presentation of the results of empirical tests of the two alternative models for a sample of developing nations.

Theoretical Models

Two competing theoretical models have emerged to explain fertility decline in developing nations: the Innovation/Diffusion and Adjustment models. The former model attributes fertility decline to family planning programs, while the latter model focuses on structural development. These two models were discussed in Chapter Two.

Innovation/Diffusion. The Innovation/Diffusion model attributes fertility decline to birth control. The key to the effect of contraception on fertility is in its diffusion. The diffusion of contraception is not assumed to occur simultaneously in all areas. Rather, the innovation of contraception proceeds through a series of lags and a trickle down effect based on, for example, differences in regionality, urbanization, and class (Carlsson, 1966).

Today, family planning programs aid the diffusion process. The distribution of contraceptive technology, services, and family size limitation information through networks of family planning clinics accelerate the rate of diffusion of contraception. By supporting the diffusion of contraception, family planning programs function to reduce fertility. In effect, the greater the family planning commitment of a nation, the lower the fertility rate.

Adjustment. The Adjustment model of fertility decline emphasizes the effect of structural development on fertility-related behavior. The key component is motivation. Individual behavior, it is assumed, does not change without sufficient motivation. Changes associated with structural development function to reduce the motivation for large numbers of children.

Structural changes associated with development such as increased educational opportunities, better health and economic conditions, and changes in the roles of women increase the perceived costs of having large numbers of children. An increase in the perceived costs of having large families provides the motivation to use contraceptive methods and limit family size. In effect, the greater the structural development of a nation, the lower the fertility rate.

Existing Research

Previous research examining the two competing theoretical models of fertiltiy decline was examined in Chapter Two. This research has consisted of singular as well as simultaneous tests of the two models. Only recent sub-national and cross-national simultaneous tests of the two models were discussed in detail.

Sub-national research. Previous sub-national studies which simultaneously tested both models of fertility decline have been undertaken for a variety of countries. They include analyses of Chile (Taucher and Bocaz, 1978), the Republic of Korea (Foreit et al., 1980; Kim et al., 1982), Pakistan (Rukanuddin et al., 1984), Sri Lanka (Devendra, 1984), Colombia (Uchoa, 1984) and India (Srikantan, 1977).

In each case, different measures of development, family planning, and fertility were used to assess the two models.

The overwhelming majority of these studies present support for the adjustment model. However, this research is characterized by several shortcomings (e.g., Hernandez, 1984; Sherris et al., 1985). Most importantly, this research does not provide the basis for assessing the validity of the two models beyond individual nations.

Cross-national research. Cross-national research which has simultaneously tested both models does provide the basis for assessing the validity of the two models beyond individual nations. Previous researchers examined fertility decline for samples of developing nations for time periods ranging from 1965-1975 to 1960-1980 (Mauldin and Berelson, 1978; Tsui and Bogue, 1978; Cutright, 1983; Hernandez, 1984; Tolnay and Christenson, 1984). Variables used in the analyses included those associated with development (e.g., economic development, education, urbanization, and mortality), and the family planning effort scale developed by Lapham and Mauldin (1972).

The findings of previous cross-national research differ somewhat, though, most studies support both models of fertility decline. Hernandez (1981b; 1984), however,

maintains that several researchers have overestimated the unique effect of family planning because they failed to control for variables such as island status and population density. In turn, with one exception (Cutright, 1983), existing cross-national studies have been confined to the time period of circa 1965-1975.

Empirical Test

This thesis remedied the shortcomings of previous cross-national tests of the two models by analyzing fertility decline for the 1970-1980 time period, incorporating population density as a control variable, and restricting the analysis to non-island nations.

The data and method used in the analysis were discussed in Chapter Three. The sample consisted of 59 developing nations. Only non-island nations with populations of more than one million for which complete data were available for all variables were included in the analysis. Fertility was measured using the percent decline in CBR for 1970-1980. The Family Planning Effort Scale developed by Lampham and Mauldin (1972) was used to measure family planning commitment. Development was measured with an additive index consisting of four variables: female secondary school enrollment, per capita GNP, life expectancy, and percent of the population living in urban areas. Population density

was included as a control variable. OLS regression was used in the analysis of the data.

Results of the analysis were presented in Chapter Four. Family planning and development both had the expected positive effect on fertility decline. However, family planning had a greater effect on fertility decline. Population density had a weak and negative effect on the dependent variable.

In order to assess the stability of the results, the ten worst outliers in the residuals were deleted and the model was reestimated. The results indicated that family planning and development continued to have a significant and positive effect on fertlity decline. Population density proved to have only a weak effect on fertility decline.

In sum, results suggested support for the validity of both models of fertility decline. The effect of family planning commitment, however, proved to be stronger than the effect of structural development. This finding suggests that family planning commitment was a more important determinant of fertility decline for the sample of developing nations during the 1970-1980 time period.

IMPLICATIONS

There are several theoretical and policy related implications which emerge from the analysis. Results suggest support for both the Innovation/Diffusion and Adjustment models of fertility decline. Policies directed towards the reduction of fertility should emphasize both family planning and development.

Theoretical Implications

Since results indicate support for both the Innovation/Diffusion and Adjustment models, it appears that the image of two contradictory models of fertility decline found in the literature is misleading. This finding has important implications for model building efforts. Future efforts should concentrate on the development of a general model of fertility decline that incorporates both models.

Policy Implications

Evidence indicates that both structural development and family planning are important in explaining fertility decline. The policy implications of the results are clear: fertility reduction policies should emphasize both family planning and development. Furthermore, both factors are subject to direct manipulation. For example, increasing educational opportunities for women, improving health

conditions, and increasing the effectiveness of family planning programs should lead to a reduction in fertility rates.

SUGGESTIONS FOR FUTURE RESEARCH

Additional research is needed. Models should be constructed that include exogenous factors such as world system position. Additional analyses should be undertaken for different time periods. Different measures of family planning and development should be incorporated in future studies.

The dominant models of fertility are limited. Typically, only factors endogenous to nations are considered. However, nations do no exist within a vacuum. External factors such as position in the world economic system could affect fertility indirectly through its effects on structural development, family planning program commitment, and other variables. Future research examining the effects of macro-factors on fertility decline should incorporate this and other exogenous factors.

Future research should be undertaken for different time periods to assess the possibility that development and family planning have had different effects on fertility decline for different time periods. For example, to date no

one has examined the time period of 1975-1985. In addition, earlier time periods should also be examined to assess the effects of the two factors on fertility decline.

Different measures of family planning and development should be used in future analyses in order to further assess the validity of the two models. For example, new measures of family planning should be developed that take into account the shortcomings of the scale used in this analysis. A wider variety of development measures should be used in future analyses to assess the stability of the effect of development on fertility decline. In addition, future researchers should try to identify those specific measures of development that have the greatest impact on fertility decline. Such efforts may facilitate a clearer understanding of the impact of development on fertility decline.

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A CROSS-NATIONAL ANALYSIS OF THE IMPACTS OF FAMILY PLANNING AND DEVELOPMENT ON FERTILITY DECLINE IN DEVELOPING NATIONS

by

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ABSTRACT

Over the past two decades, demographers have noted a decline in fertility rates for many developing nations. Two competing theoretical models have emerged to account for this decline in fertility: the Innovation/Diffusion and Adjustment models. The former model attributes fertiltiy decline to family planning programs, while the latter model focuses on structural development.

The thesis examined the empirical validity of the two models. Specifically, the effects of family planning and structural development on fertility were examined while controlling for the effect of population density. The sample consisted of 59 developing nations for the time period of 1970-1980. Regression estimates were made using both the full sample and a sample with tne ten worst outliers in the residuals deleted. Results of both analyses indicated that family planning and development had significant, positive effects on fertility decline. However, the effect of family planning was greater than the effect of development on fertility decline. While this latter finding suggests that family planning was a more important determinant of

fertility decline for this sample and time period, results suggest support for both models of fertility decline.

The theoretical and policy implications of the research were examined. Additionally, suggestions for future research were discussed.