

INNOVATION-DIFFUSION OR ADJUSTMENT: THE CASE OF TAIWANESE FERTILITY TRANSITION†

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INTRODUCTION

The transition of fertility behavior in Taiwan is an important topic for demographers who are interested in studying the fertility-decline determinants in developing countries. Taiwan provides a useful case study, since it is one of the leading developing countries and also has experienced significant fertility decline during the past 25 years. Taiwan's crude birth rate, for example, fell from 35 per thousand in 1964 to 23 per thousand in 1980, representing a shift in completed family size from 5 to 6 to approximately 2.5 children per family. In the same period, significant socioeconomic changes also occurred, which transformed Taiwan from an agricultural society into a predominately industrial one. By 1980, the life expectancy for women reached 74 years, more than 67 percent of the population resided in metropolitan areas, over 62 percent of females six years of age and older had received education above the primary school level, and only 28 percent of the population remained in the agricultural sector (1980 Taiwan-Fukien Demographic Fact Book). These figures indicate that Taiwan is a developing country that has experienced recent rapid socioeconomic changes and has completed the demographic transition.

Clearly, such a transition of fertility requires studies focusing on the process,

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result, and impact of the unprecedented changes. Studies of Taiwanese fertility have been conducted from various perspectives. Those by Freedman and his colleagues concerning the factors associated with demographic trends in Taiwan are generally individual-level analyses based on fertility surveys. They provide information which helps to illuminate essential demographic trends in Taiwan (Freedman et al. 1971, 1977, 1980, 1981). Areal-unit analyses by Hermalin (1970, 1971, 1973, 1975, 1978), Hermalin and Lavelly (1979), and Schultz (1971a, 1971b, 1973) on contraception and fertility develop basic models for investigation into macro-level correlates of fertility. The Schultz studies also include short-term period analyses. These undertakings, however, have not analyzed areal variations in long-term fertility or contraception trends. Anderson's study (1974) did take up this question, analyzing areal variations in fertility from 1952 to 1970, but his study was based on hsien-level (county) data and failed to show the detailed differentials which might exist between smaller areas (precinct, chen, and hsiang). Ting (1983 and 1984) has conducted studies analyzing areal-unit variations of family-limitation behavior in Taiwan and found that the innovation-diffusion explanation was important in the 1960s but that socioeconomic changes had significant impact on practicing family-limitation behavior in the 1970s.

Important questions regarding the transition of fertility behavior in Taiwan require further research using individual-level data such as information collected through island-wide KAP surveys. The major goal of this research is to examine two competing models in fertility study, diffusion and adjustment, as explanations for the various stages of fertility transition in Taiwan. The Taiwan Provincial Family Planning Institute continually collected island-wide KAP (Knowledge, Attitude, and Practice of Fertility) data from 1965 to 1980, and these data sets permit researchers to conduct retrospective time-series analysis of the changing fertility behavior in Taiwan.

The current study uses KAP data sets to analyze the determinants of Taiwan's fertility decline between 1964 and 1980 and to evaluate whether innovation-diffusion or adjustment or both can be applied to explain the transition. Furthermore, this study examines the roles of innovation-diffusion and adjustment in the stages of the transition of Taiwan's fertility from high to low levels.

THEORETICAL FRAMEWORK

Previous studies of demographic transition have emphasized both the historical patterns of demographic transitions in developed societies and their implications for the developing countries. One of the major debates surrounding these studies is whether the pattern of fertility decline is due to an innovation-diffusion process or to an adjustment process.

The innovation-diffusion perspective stresses that birth control, especially contraception, is essentially new to human culture. Innovation-diffusion also assumes that the decline of fertility starts in a setting where there is no, or at the most, a very limited practice of birth control. The theory emphasizes the importance of the spread of information. It assumes that innovation starts in metropolitan centers, diffuses with some delay to other urban locations, and later still penetrates to rural areas. Innovative behavior diffuses not only from urban to rural areas but also from one area to another that is culturally and linguistically similar.

The adjustment theory, on the other hand, does not regard birth control, and especially contraception, as new to human society. It emphasizes that birth control may have historically been practiced by part of the populace while the population as a whole maintained high fertility targets. This theory interprets the recent decline of fertility as an adjustment to social change. This adjustment process does not necessarily involve a time lag in the fertility decline (Carlsson 1966: 149-150).

Carlsson's study of Swedish population argues that adjustment rather than innovation was the main process which produced the Swedish marital-fertility decline. He found that a substantial percentage of families in Sweden deliberately controlled their fertility long before the general decline occurred, and he argued that geographic diffusion models or urban-to-rural gradient patterns did not help in understanding the Swedish marital-fertility decline (Carlsson 1966). Knodel, on the other hand, argued that to accept the adjustment perspective did not mean that the diffusion perspective must be discarded. He studied a number of European and Asian populations and developed the theory that the innovation force of family limitation might be the dominant factor in the initial stage of fertility decline but

that an adjustment process became dominant at a later stage. Thus once the possibility of family planning becomes generally known and accepted, desired family size changes in time with the changing socioeconomic conditions (Knodel 1977: 482).

Studies on Taiwan's fertility transition have emphasized aggregate-data analyses of family-limitation behavior (see Ting 1983 and 1984). Ting (1983) used the concepts of demand-side (urban to rural) and supply-side (family-planning program efforts) diffusions of family-limitation behavior and adopted the level of socioeconomic developments to represent the adjustment process. Based on both cross-sectional and pooled-time series regression analyses, Ting found that diffusion models were more important in the 1960s than they were in the 1970s. While the importance of the adjustment model was not as easily determined, the conditional effect of female education was significant in the increase of areal family-limitation practice and the changes over time in the pooled-time series analysis. The transition of family-limitation practice in Taiwan apparently is not dominated by either the diffusion or the adjustment model. The process is complex and requires both models to explain the conditions under which one area will evolve from low to high levels of family-limitation (Ting 1983: 212). Findings derived from geographic analysis of Pingtung county in Taiwan indicate similar diffusion-function trends, though ethnicity was found to be an important obstacle in the process of diffusing the idea of family limitation across townships (Ting 1984).

Trend data from individual-level surveys in Taiwan, therefore, become extremely useful in examining the findings discussed above, since evidence from such analyses can illuminate more clearly the determining function of the process. Accordingly, data from Taiwan KAP surveys are used in this study based on individual information. The analytical model includes diffusion factors (both demand-side and supply-side), adjustment factors, and other control factors.

The demand perspective of diffusion represents the traditional approach suggested by Hägerstrand (1967 and 1968). This approach focuses upon a spatial process by which the adoption or demand occurs, and it interprets the demand for an innovation as the result of a learning or communication process. The most important aspect of this process is that it occurs with a spatial frame of reference. Thus, the initial and essential steps in the study of the diffusion process are the

identification of the spatial characteristics of information flows. Therefore, the level of urbanization of residence (categorized into cities, urban townships, and rural townships) can be considered for individual-level analysis as the measure of respondents' distance to urban or information centers in Taiwan. This study postulates that those living in cities have better access to contraceptive information than those who live in urban and rural townships. If this relationship does exist and has strong influence on the dependent variable, then one can argue that demand-side diffusion is important.

Brown (1975, 1977, 1981) first suggested diffusion's supply-side perspective. This perspective emphasizes the differences in the availability of innovation for potential acceptors. Brown (1981) identified two elements which differentiate this supply perspective from the demand perspective: the establishment of diffusion agencies and the establishment of a market strategy for the innovation. The establishment and operation of Taiwan's family-planning program started in 1964. The island-wise program provided professionals to disseminate information on various kinds of contraception to the populace. In addition, other sources of information such as mass communication and neighbors and relatives must also be taken into consideration. Therefore, the contraception information variable is categorized into "do not know," "mass media," "professional," and "neighbors and relatives" in order to test the impact of the information flow through the official family-planning program in Taiwan.

A woman's educational level is traditionally treated as an important explanatory variable in analyzing fertility behavior. Most studies have reported an inverse relationship between fertility and educational level (see Freedman, Fan, and Wei 1977; Freedman, Moots, and Wei 1979; Coombs and Sun 1979). Schultz, however, discovered a positive relationship between Taiwanese fertility and female schooling (1973). However, one expects a negative relationship between male employment in modern sectors and family size. This study on Taiwan's fertility transition anticipates that a wife's educational level will prove to be negatively related to the number of children she bears.

A man's increasing employment in modern sectors such as professional employment, engineering, administration, business, and service industries represents changes that give him more contact with modern ideas and information. If these

interactions and experiences outside the traditional sectors can in turn influence his attitudes toward family size, a man may prefer limiting his number of children. Thus one expects a negative relationship between male employment in modern sectors and family size.

The increasing consumption of consumer (or durable) goods in developing countries is often interpreted by many demographers as a sign of shifting attitudes from traditional toward modern values. In other words, it may indicate that people are more likely to spend their money on purchasing household items for a better life rather than on raising additional children. Accordingly, one expects to find that a couple's level of owning consumer goods is negatively related to the number of children they have.

The independent variables above (wife's education, husband's occupation, and index of household consumer goods) are measures of socioeconomic changes experienced by the respondents. Theoretically, they reflect the adjustment process individuals in Taiwan have undergone. If the adjustment process has an important impact on fertility behavior, one should observe a statistically significant influence on these variables during the years under study.

The independent variables of duration of marriage, ethnicity, experience of abortion, and rural experience, are included as other factors that may also affect fertility. Among them, duration of marriage is probably the most basic and important variable, as it controls the time a respondent needs to reproduce a number of children. The ethnicity variable represents the unique ethnic structure of Taiwanese society and requires study focusing on the interrelationships among Fukienese, Hakkas, and Mainlanders (see Ting 1983: 151-174). Naturally, one expects mainlanders to have smaller family. In general, one expects Mainlanders to have smaller families than do Hakkas and Fukienese and for Hakkas to be more conservative in contraceptive behavior than Fukienese. Since experience of abortion implies practicing limiting family size by means other than conception prevention, it perhaps also reflects a married couple's decision to adopt additional means to control their family size. Rural experience sometimes represents exposure to traditional attitudes. Therefore people with rural experience are expected to behave differently from those who have not had such experience. Presumably, they tend to prefer large families.

DATA SOURCES AND METHODS OF ANALYSIS

The data used in the current study are KAP surveys collected by the Taiwan Provincial Institute of Family Planning. While these surveys are designed to investigate knowledge, attitudes, and practices of Taiwanese at various times in recent years, for present purposes they are advantageous in that they are much more readily available than any other data sets for Taiwan. The five cross-sectional KAP surveys for this study focus on the fertility behavior of married women living in Taiwan in 1965, 1969, 1970, 1973, and 1980.

Since the dependent variable, number of children born, is basically an interval-scale variable, multivariate analysis for each year is conducted using multiple classification analysis (MCA). This method is extremely useful in analyzing an interval-scale dependent variable if its distribution is not drastically skewed (Andrews et al. 1973). The estimations of MCA models include cross-sectional analyses for the five years under study and a pooled-time series analysis of the combined set.

The most important results from the MCA analysis are the unadjusted and the adjusted deviations of the mean. The unadjusted deviation of each category for the independent variables indicates the deviation of the specific category of the independent variable under study from the grand mean; while the adjusted deviation implies similar statistical meaning but only adjusts for the other independent variables included in the MCA model. The Eta and Beta coefficients represent the level of explanatory ability in the independent variables for unadjusted and adjusted analyses, respectively. The R^2 in regression analysis, is the proportion of variance in the dependent variable explained by the independent variables.

CROSS-SECTIONAL ANALYSIS

With the exception of the adjusted coefficients in KAP III and IV, the findings in Table 1 indicate that the urbanization variable is a good predictor of family size for each of the years studied as well as for the pooled-time series analysis. In 1965 (KAP I), the urbanization variable in both the unadjusted and adjusted situations displays an inverse U relationship with the number of children born to the respondents. This indicates that whether or not the other independent variables were

controlled, respondents living in both the most urbanized cities and the least urbanized rural townships had fewer children than those who lived in the urban townships. The statistical pattern turns to a U relationship, however, for unadjusted analyses between the urbanization variable and the number of children born for KAP II, III, and IV; the findings of 1980 data remain the same as those of KAP I. More precisely, however, for both unadjusted and adjusted analyses, residents living in urban centers (cities) have significantly fewer children than residents living in either urban or rural townships have. This indicates that during the years under study, cities seem to function as centers of demand-side diffusion. Furthermore, this demand-side diffusion process was statistically significant for adjusted analyses of KAP I (1965) and II (1969), but insignificant in regard to Beta coefficients for KAP III (1970) and IV (1973). The KAP V data of 1980 retains the earlier statistically significant Beta coefficient. This pattern of significant/insignificant demand-side diffusion function for the 1960s and the 1970s respectively is similar to the findings obtained from previous aggregate-data analyses (see Ting 1983 and 1984).

The source of contraception information variable is constructed to represent the supply-side diffusion function discussed in the theoretical model. The categories of this variable presented in Table 1 are more complicated than the simple measurement of the impact of a family-planning program, since the respondents could have learned about contraception from sources in addition to the program such as mass media and neighbors and relatives. Additionally, the response "do not know" may not necessarily imply that individuals really had no knowledge of practicing contraception. An analysis of the socioeconomic background of the respondents of this category, however, did not support this argument; they were no better in terms of education or occupation than the other respondents.

Although the unadjusted deviations for those responding "do not know" have no uniform impact on the number of children born, the adjusted deviations in this category consistently show the most negative values over the five years studied. In other words, they had the fewest children. If those who indicated "do not know" in fact represent respondents with higher socioeconomic status, they probably were practicing contraception using methods other than those provided by the official family-planning program, and this in turn resulted in the above MCA findings. While there is no consistent pattern across the KAP surveys for both unadjusted and adjusted deviations in the categories "mass media" and "neighbors and

Table 1: MCA Determinants of Taiwan KAP Surveys

(KAP I)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	1444	-0.39	0.11**	-0.07	0.05**
2. Urban Township	1421	0.25		0.19	
3. Rural Township	2350	0.09		-0.07	
Contraception Information					
1. Do not know	1113	-0.40	0.16**	-0.43	0.12**
2. Mass Media	53	-0.48		0.11	
3. FPP Prof.	1746	0.49		0.33	
4. Neighbors & Relative	2303	-0.17		-0.05	
Wife's Education					
1. 0-5 Years	2628	0.45	0.21**	0.00	0.04**
2. 6 Years	2074	-0.34		0.06	
3. 7-12 Years	480	-0.76		-0.18	
4. 13+ Years	36	-2.50		-0.90	
Husband's Occupation					
1. Prof.	44	-0.30	0.15**	-0.06	0.05**
2. Admini.	1431	-0.45		-0.09	
3. Business	494	-0.37		-0.28	
4. Labor	1574	0.13		0.03	
5. Agri.	1672	0.38		0.13	
Index of Consumer Goods					
1. Low	1184	0.82	0.22**	0.21	0.06**
2. Mid. Lower	1133	0.17		0.08	
3. Mid. Higher	1269	-0.35		-0.06	
4. High	1629	-0.44		-0.16	
Duration of Marriage					
1. 0-5	1094	-2.69	0.76**	-2.43	0.67**
2. 6-10	1253	-0.91		-0.76	
3. 11-15	1113	0.46		0.44	
4. 16-20	1069	1.56		1.40	
5. 20+	763	2.49		2.12	
Ethnicity					
1. Fukienese	4098	0.04	0.15**	0.02	0.07**
2. Hakka	732	0.42		0.20	
3. Mainlander	462	-1.05		-0.53	
Experience of Abortion					
1. No	3991	-0.63	0.47**	-0.30	0.23**
2. Yes	1301	1.94		0.93	
Rural Experience					
1. No	930	-0.46	0.09**	-0.14	0.03**
2. Yes	4362	0.10		0.03	

Grand Mean = 4.03

 $R^2 = 0.66$ ** $P < 0.01$

Table 1 (continued)

(KAP II)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	1504	-0.22	0.07**	-0.08	0.03*
2. Urban Township	1352	0.00		0.04	
3. Rural Township	1986	0.17		0.04	
Contraception Information					
1. Do not know	2532	0.06	0.11**	-0.18	0.09**
2. Mass Media	160	-1.19		-0.16	
3. FPP Prof.	660	0.18		0.33	
4. Neighbors & Relative	1490	-0.05		0.18	
Wife's Education					
1. 0-5 Years	2109	0.57	0.26**	0.08	0.06**
2. 6 Years	2190	-0.26		0.01	
3. 7-12 Years	511	-1.12		-0.32	
4. 13+ Years	32	-1.67		-0.97	
Husband's Occupation					
1. Prof.	84	-0.82	0.14**	0.09	0.01
2. Admini.	1197	-0.41		0.01	
3. Business	659	-0.18		0.02	
4. Labor	1088	0.10		-0.03	
5. Agri.	1814	0.31		0.00	
Index of Consumer Goods					
1. Low	984	0.65	0.19**	0.11	0.05**
2. Mid. Lower	1348	0.17		0.06	
3. Mid. Higher	1282	-0.13		0.03	
4. High	1228	-0.56		-0.19	
Duration of Marriage					
1. 0-5	961	-2.55	0.74**	-2.30	0.65**
2. 6-10	1160	-0.76		-0.63	
3. 11-15	1081	0.36		0.36	
4. 16-20	926	1.26		1.14	
5. 20+	748	2.37		2.00	
Ethnicity					
1. Fukienese	3623	0.08	0.12**	0.06	0.09**
2. Hakka	646	0.21		0.10	
3. Mainlander	607	-0.71		-0.49	
Experience of Abortion					
1. No	3782	-0.56	0.48**	-0.30	0.25**
2. Yes	1094	1.94		1.03	
Rural Experience					
1. No	835	-0.29	0.06**	-0.08	0.02
2. Yes	4041	0.06		0.02	

Grand Mean = 3.95 $R^2 = 0.629$ * $P < 0.05$ ** $P < 0.01$

Table 1 (continued)

(KAP III)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	698	-0.20	0.08**	-0.08	0.03
2. Urban Township	654	0.02		0.07	
3. Rural Township	954	0.13		0.02	
Contraception Information					
1. Do not know	660	0.06	0.10**	-0.28	0.11**
2. Mass Media	116	-0.74		-0.01	
3. FPP Prof.	429	0.15		0.23	
4. Neighbors & Relative	1101	-0.02		0.08	
Wife's Education					
1. 0-5 Years	894	0.37	0.24**	0.12	0.10**
2. 6 Years	1135	-0.06		0.01	
3. 7-12 Years	266	-0.92		-0.40	
4. 13+ Years	11	-2.09		-0.84	
Husband's Occupation					
1. Prof.	40	-0.72	0.16**	-0.08	0.03
2. Admini.	573	-0.42		-0.06	
3. Business	308	-0.06		0.07	
4. Labor	535	0.24		0.03	
5. Agri.	850	0.19		0.00	
Index of Consumer Goods					
1. Low	307	0.77	0.24**	0.32	0.09**
2. Mid. Lower	601	0.28		0.08	
3. Mid. Higher	771	-0.13		-0.05	
4. High	627	-0.49		-0.17	
Duration of Marriage					
1. 0-5	254	-2.01	0.64**	-2.02	0.64**
2. 6-10	645	-0.90		-0.90	
3. 11-15	620	0.19		0.18	
4. 16-20	538	0.95		0.95	
5. 20+	265	1.76		1.78	
Ethnicity					
1. Fukienese	1728	0.05	0.11**	0.05	0.09**
2. Hakka	309	0.18		0.13	
3. Mainlander	285	-0.48		-0.42	
Experience of Abortion					
1. No	2277	0.00	0.01	-0.01	0.04*
2. Yes	45	-0.09		0.45	
Rural Experience					
1. No	392	-0.22	0.06**	-0.15	0.04*
2. Yes	1930	0.05		0.03	

Grand Mean = 4.00

 $R^2 = 0.47$ * $P < 0.05$ ** $P < 0.01$

Table 1 (continued)

(KAP IV)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	1920	-0.15	0.09**	-0.01	0.01
2. Urban Township	1157	-0.05		0.01	
3. Rural Township	1883	0.18		0.01	
Contraception Information					
1. Do not know	2424	-0.59	0.35**	-0.20	0.12**
2. Mass Media	192	-0.04		0.05	
3. FPP Prof.	2344	0.62		0.20	
4. Neighbors & Relative	---	---			
Wife's Education					
1. 0-5 Years	1385	0.69	0.30**	0.11	0.07**
2. 6 Years	2886	-0.11		0.00	
3. 7-12 Years	614	-0.82		-0.17	
4. 13+ Years	75	-1.65		-0.66	
Husband's Occupation					
1. Prof.	120	-0.69	0.20**	-0.07	0.02
2. Admini.	1437	-0.27		-0.01	
3. Business	458	0.04		-0.03	
4. Labor	1766	-0.13		-0.01	
5. Agri.	1179	0.58		0.06	
Index of Consumer Goods					
1. Low	1234	0.43	0.16**	0.14	0.05**
2. Mid. Lower	1209	0.03		0.00	
3. Mid. Higher	1288	-0.15		-0.08	
4. High	1229	-0.31		-0.06	
Duration of Marriage					
1. 0-5	1360	-1.79	0.72**	-1.72	0.68**
2. 6-10	1561	-0.15		-0.11	
3. 11-15	1348	0.66		0.66	
4. 16-20	955	1.44		1.32	
5. 20+	210	1.94		1.75	
Ethnicity					
1. Fukienese	3804	0.05	0.07**	0.07	0.09**
2. Hakka	682	0.05		0.05	
3. Mainlander	948	-0.24		-0.34	
Experience of Abortion					
1. No	4753	-0.22	0.34**	-0.12	0.20**
2. Yes	681	1.51		0.86	
Rural Experience					
1. No	---	---	---	---	---
2. Yes	---	---	---	---	---
Grand Mean = 3.17 R ² = 0.587 ** P < 0.01					

Table 1 (continued)

(KAP V)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	1497	-0.17	0.11**	-0.06	0.07**
2. Urban Township	849	0.22		-0.17	
3. Rural Township	1110	0.06		-0.05	
Contraception Information					
1. Do not know	1139	-0.81	0.42**	-0.38	0.19**
2. Mass Media	255	-0.16		0.14	
3. FPP Prof.	1989	0.47		0.19	
4. Neighbors & Relative	73	0.32		0.10	
Wife's Education					
1. 0-5 Years	528	0.93	0.41**	0.17	0.12**
2. 6 Years	1939	0.15		0.08	
3. 7-12 Years	813	-0.70		-0.18	
4. 13 Years	176	-1.18		-0.49	
Husband's Occupation					
1. Prof.	95	-0.40	0.22**	-0.02	0.03
2. Admini.	1233	-0.24		-0.04	
3. Business	284	0.04		-0.02	
4. Labor	1389	-0.01		0.00	
5. Agri.	455	0.74		0.11	
Index of Consumer Goods					
1. Low	845	0.50	0.23**	0.14	0.06**
2. Mid. Lower	886	0.07		-0.01	
3. Mid. Higher	901	-0.18		-0.06	
4. High	824	-0.39		-0.06	
Duration of Marriage					
1. 0-5	1168	-1.31	0.69**	-1.28	0.68**
2. 6-10	1029	0.09		0.08	
3. 11-15	847	0.69		0.69	
4. 16-20	557	1.20		1.17	
5. 20+	111	1.65		1.61	
Ethnicity					
1. Fukienese	2782	0.03	0.04**	0.06	0.11**
2. Hakka	469	-0.04		0.04	
3. Mainlander	461	-1.05		-0.42	
Experience of Abortion					
1. No	3472	-0.10	0.27**	-0.06	0.18**
2. Yes	240	1.46		0.93	
Rural Experience					
1. No	---	---	---	---	---
2. Yes	---	---	---	---	---

Grand Mean = 2.70

 $R^2 = 0.574$ ** $P < 0.01$

Table 1 (continued)

(Pooled-time Series)	N	Unadj.	Eta	Adj.	Beta
Urbanization					
1. City	7217	-0.32	0.11**	-0.06	0.03**
2. Urban Township	5492	0.13		0.10	
3. Rural Township	8331	0.19		-0.01	
Contraception Information					
1. Do not know	7212	-0.43	0.18**	-0.23	0.09**
2. Mass Media	776	-0.66		0.01	
3. FPP Prof.	8081	0.26		0.17	
4. Neighbors & Relative	4971	0.32		0.06	
Wife's Education					
1. 0-5 Years	7564	0.73	0.32**	0.05	0.05**
2. 6 Years	10324	-0.19		0.02	
3. 7-12 Years	2776	-1.01		-0.16	
4. 13+ Years	376	-1.94		0.48	
Husband's Occupation					
1. Prof.	401	-0.79	0.19**	-0.04	0.02**
2. Admini.	6007	-0.46		-0.04	
3. Business	2221	-0.06		-0.05	
4. Labor	6422	-0.06		0.00	
5. Agri.	5989	0.56		0.07	
Index of Consumer Goods					
1. Low	4584	0.57	0.18**	0.15	0.05**
2. Mid. Lower	5228	0.14		0.05	
3. Mid. Higher	5586	-0.19		-0.03	
4. High	5642	-0.40		-0.13	
Duration of Marriage					
1. 0-5	4839	-2.16	0.73**	-1.99	0.65**
2. 6-10	5652	-0.52		-0.43	
3. 11-15	5011	0.48		0.49	
4. 16-20	4049	1.39		1.27	
5. 20+	2097	2.54		2.13	
Ethnicity					
1. Fukienese	16045	0.06	0.11**	0.06	0.09**
2. Hakka	2838	0.20		0.13	
3. Mainlander	2765	-0.56		-0.48	
Experience of Abortion					
1. No	18285	-0.36	0.42**	-0.19	0.21**
2. Yes	3363	1.96		1.01	
Time Series					
1. I, II	10177	0.43	0.24**	0.16	0.10**
2. III, IV	7759	-0.15		-0.02	
3. V	3712	-0.88		-0.40	

Grand Mean = 3.57

R² = 0.625

** P < 0.01

relatives," those who learn about practicing contraception from "family-planning program workers" show a clear tendency to have more children. This finding is quite different from what was hypothesized. One plausible explanation of this pattern is that the target clients of the family-planning programs are those who already have large families and are unable to obtain through a private channel the means to practice contraception.

The educational level of the women studied has a consistent negative impact on family size. Nevertheless, the inverse relationship between educational level and family size is weaker after controlling for other independent variables. This can be observed by comparing unadjusted and adjusted deviations of means for each year under study. Of significance, however, is that education increases in importance over the entire period studied. This is indicated in the steady increase of the sizes of both the Eta and Beta coefficients. Even when controlling for other independent variables, education is significant in the reduction of family size. This function, however, is even greater under conditions where other independent variables are not controlled. Education is traditionally considered an important structural variable in analyzing fertility change, and KAP surveys again indicate the influence of education on fertility behavior.

Except for KAP II, the husband's occupation variable in the MCA model reflects a significant relationship to family size. Compared to occupations associated with traditional work environments such as agriculture and fishing, manual laborers show more control over their fertility. However, these workers, either unskilled or skilled, tend to have larger families when compared to professionals, administrators, and businessmen. The distinction between these modern occupations and the more traditional agricultural and fishing vocations is of theoretical importance. A major component of socioeconomic modernization is occupational diversification, which is likely to affect both the ideal number of children and fertility behavior. Employment opportunities in modern sectors including service industries, businesses, and factories often allow more access to modern ideas, information, and lifestyles. Therefore, those employed in these non-traditional sectors are more likely to adopt the idea of family planning and thus have smaller families. The use of the occupation variable in this analysis and the focus on its specific influence on fertility behavior are appropriate to account for the explanatory ability of the adjustment model for studying fertility transition in Taiwan.

The index of consumer goods variable measures the impact of structural change on fertility behavior. Owning consumer goods has powerful effects on fertility behavior as indicated by Eta coefficients across all the five time periods. Regardless of the strength of the other independent variables, the index of consumer goods retains its influence on family size, although the Beta coefficients are relatively smaller when compared with the uncontrolled ones. By using this variable as a surrogate of respondents' socioeconomic status, the results in Table 1 present clear and consistent findings over time. The findings are consistent with hypothesized relations between the consumption of goods and family size and lend support to the adjustment model. Additionally they suggest that an increase in the demand for consumer goods in developing countries may induce a movement towards smaller family size.

Duration of marriage explains the largest proportion of variation in fertility behavior. This finding is logical and wholly consistent with earlier arguments in this paper. Table 1 reports a very clear and positive relationship between duration of marriage and the number of children. Both the Eta and Beta coefficients of this variable show that it is the most powerful independent variable in the MCA model. Since duration of marriage is treated as a control variable here, along with ethnicity, experience of abortion, and rural experience, this statistical result provides sufficient evidence that the researcher can evaluate the relative importance of diffusion and adjustment models only after controlling for duration of marriage.

Results obtained in analyzing ethnic differences show that Mainlanders have the least number of children when compared with Fukienese and Hakkas. While Hakkas tended to have larger family size than the Fukienese in the 1960s (KAP I through III), they had about an equal number of children in the early 1970s (KAP IV) and a surprisingly smaller family size in the KAP V survey. Except for the Hakkas' findings in the 1980 study, the empirical evidence offers results that most demographers familiar with Taiwan would predict for the above analysis (see Ting 1983 and 1984).

Experiences of abortion for Taiwanese women often reflect their use of abortion as a means to interrupt unwanted pregnancies, especially in the case when they already have the desired number of children. Frequently, this implies that these women have failed to practice contraception at earlier times yet have no desire to

increase their already large families. Both the unadjusted and adjusted analyses indicate greater deviations from the means for women who have had abortions. The magnitudes of the Eta and Beta coefficients also suggest that this is a very important independent variable, second only to duration of marriage. Only the unadjusted means in the KAP III survey deviate from this pattern. The inconsistent findings of the KAP III survey perhaps reflect the very small number of respondents classified as having had previous abortion experience.

The last independent variable to be discussed in the MCA model is rural experience. It is included in order to control the possible influence that comes from migrants with early-life rural experience. Consistent positive impact of rural experience on the number of children born is evident from KAP I through KAP III (KAP IV and V have no information on rural experience). Women with rural backgrounds have more children. Thus, the absence of rural experience results in smaller families.

POOLED-TIME SERIES ANALYSIS

Results from the pooled-time series analysis are essentially the same as those observed in the cross-sectional analyses. Since the KAP IV and V surveys did not ask questions about rural experience, this variable could not be included in the pooled-time series analysis. In contrast to the cross-sectional analysis, a new independent variable was created in order to measure the effect of time. KAP I and II data are combined to represent time I (1965 and 1969), KAP III and IV (1970 and 1973) represent time II; KAP V (1980) is treated as the third time period.

The time variable in this analysis has a significant but negative impact on the number of children born. Stated differently, the later in time the surveys were conducted, the fewer the number of children the interviewed women had. Time periods represent, perhaps, the effects of stages of the overall socioeconomic changes which were occurring in Taiwan. In the MCA model of the pooled-time series analysis, the adjusted influence of the time variable reflects the impact of some unknown socioeconomic factors which are not included in the model. For example, by comparing the Beta coefficients of the independent variables, it can be seen that time is the third most powerful explanatory variable in the model. In fact, its

explanatory power is greater than all the diffusion and adjustment variables which have been analyzed in this study. The time variable's effects on the number of children born is quite interesting and requires future study focusing on the differential fertility of women of childbearing age during these years.

SUMMARY AND CONCLUSION

The preceding analyses of both cross-sectional and pooled-time series data sets provide evidence to support the theory that demand-side diffusion of birth control behavior from urban centers to more rural areas plays an important role in Taiwan's fertility transition. On the supply-side of diffusion, the findings are somewhat contradictory, which suggests that family planning programs have no consistently direct effects on fertility behavior. The adjustment variables of wife's education, husband's occupation, and the index of consumer goods generally have important influences on changes in family size. This suggests that the adjustment model has significant impact on fertility transition in Taiwan. Among the other factors, duration of marriage proves to be the most powerful explanatory variable. It is not surprising to find that this variable is a very important determinant of family size, since a certain period of time is obviously needed for couples to reproduce a significant number of children. This study did not, however, find the clear period-differences between the 1960s and 1970s that were observed in the aggregate-data analysis (Ting 1983). Overall, the innovation-diffusion model seems to be more useful in explaining Taiwanese fertility transition in the 1960s, and the adjustment model seems to play a more important role throughout the later years. The statistically significant impact of the time variable in the pooled-time series analysis also indicates that there are period differences between KAP surveys. These period differences need to be further analyzed using other independent variables in order to clarify the nature of the role of the time factor in fertility transition.

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新發明——擴散模型或調適模型： 台灣生育行為轉型之分析

孫得雄* 丁庭宇**

(中文摘要)

本文的主要目的在探究擴散模型與調適模型，解釋台灣生育轉型過程中各階段變化的能力。文中所使用的，是台灣省家庭計劃研究所的 KAP 資料，並以此分析 1964 年至 1980 年間台灣生育率下降的決定因素，以評估上述兩個模型的解釋能力。

經由橫剖面及時間序列的分析，計有以下幾點發現：

- 1 證實需求——擴散模型在台灣生育轉型中，扮演非常重要的角色，即生育控制行為是由都會中心擴散到外圍鄉村地區。但在另一方面卻發現一無法確定的矛盾現象，即實施已久的家庭計劃與限制生育行為之間並無直接關係。
- 2 調適模型中的自變項，諸如丈夫的教育程度及職業與消費性家庭設備指數等，對於家庭規模均有重要的影響。
- 3 此外，對於台灣生育轉型行為的解釋，以調適模型的影響較顯著。

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INNOVATION-DIFFUSION OR ADJUSTMENT: THE CASE OF TAIWANESE FERTILITY TRANSITION

(ABSTRACT)

This paper examines two competing perspectives in demographic transition theory and uses Taiwan as the case for analysis. Five KAP surveys of Taiwanese women's fertility behavior from 1965 to 1980 are adopted in this analysis. Both cross-sectional and pooled-time series analyses are presented to determine the impact of these two perspectives in the process of Taiwanese fertility transition. Findings suggest that both innovation-diffusion and adjustment models were important in explaining this fertility transition. Innovation-diffusion seemed to play a more important role in the early years whereas adjustment showed increasingly significant influence toward the end of the period.

In a paper entitled "Preferences of Asian Overseas Students for the United States: An Examination of the Causes," William K. Cummings and Wing-Chung So indicated that the number of Asian students studying abroad has been increasing remarkably since the end of the war. Also the proportion of those who study in the United States has been increasing rapidly. Important factors affecting Asian students' preference to choose the United States for overseas studies are: (1) The improvement of political relations between Asian countries and the United States; (2) the increase in the volume of economic trade between Asia and the

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