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Contraceptive Knowledge, Schooling, and Fertility: The Roles of Mass Media Exposure and Social Network

Taiwan's family planning programs, enacted nationwide in 1964, aim to decrease women's fertility and control the population growth, changing fertility demand by educating citizens on population growth issues and disseminating knowledge of modern contraceptive methods to married couples. The detailed information about women's contraceptive knowledge in the "Knowledge, Attitude and Practice of Contraception in Taiwan" data set allows researchers to measure the effect of contraceptive knowledge and evaluate Taiwan's family planning program. This paper finds that contraceptive knowledge has a negative influence on fertility. Women's years of schooling and working status are negatively associated with fertility. Household income, on the other hand, is positively associated with number of births.

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1. Introduction

One way to change people's behaviors is to provide them with information. There are several advertising messages sponsored by private or public agencies to disseminate health, nutrition, and product information aimed at changing people's behaviors. Such information about issues reaches its goal only if individuals obtain the disseminated information and transform the acquired information into new behaviors.

Taiwan's family planning programs, enacted nationwide in 1964, aim to decrease women's fertility and control the population growth, changing fertility demand by educating citizens on population growth issues, extolling the benefits of smaller families, and valuing daughters are as highly as sons; in addition, the programs disseminate knowledge about modern contraceptive methods to married couples so they may control their fertility.

Indeed, there have been debates about the relative effectiveness of contraception supply (family planning programs) and contraception demand (economic development) in decreasing fertility. Economic development and social changes might be the most important voluntary and sustainable ways to achieve fertility decline; for example, improved opportunities for women's economic advancement and education lead women to voluntarily desire fewer children, and hence the effect of family planning intervention is negligible.[1] This argument is plausible in some ways. However, in the 1960s in Taiwan, education for women was limited and knowledge of modern contraception was not widespread, so decreases in fertility were only achieved by educating couples about

[1] See Pritchett, 1994 and Gertler and Molyneaux, 1994.

population growth issues and providing them with knowledge of modern contraceptive methods.

The goal of Taiwan's family planning intervention programs is to disseminate information on population growth issues and modern contraceptive methods, and to advocate the practice of contraception among married couples to control births and decrease population growth. The goal of the programs is to change fertility demand by spreading information on population growth issues. In addition, the programs aim to decrease fertility growth by introducing and encouraging the use of contraceptives.

In several developing countries, like Taiwan, where primary education was not universal and public transportation and communication technologies were limited, spreading information through various mass media, such as radios, posters, TVs, newspapers, booklets, and magazines effectively disseminates modern contraceptive knowledge to rural areas. Furthermore, word-of-mouth communication is another important way to spread the information in developing countries.

This paper has several purposes: first, it investigates how married women in childbearing years, ages 20-39, form knowledge of each modern contraceptive technique and change their attitudes toward family planning. In addition, it emphasizes the roles of mass media and word-of-mouth in determining their knowledge and attitudes toward modern contraceptive techniques. Finally, this paper further investigates whether married women transformed their knowledge into new behaviors--that is, whether obtainment of contraceptive knowledge reduces fertility.

The detailed information on women's contraceptive knowledge, retrospective contraceptive practice, fertility history, mass media exposure, and demographic

characteristics in the "Knowledge, Attitude and Practice of Contraception in Taiwan" data sets allow researchers to measure the forming of attitudes toward contraceptive knowledge, and how the obtainment of contraceptive knowledge varies by socioeconomic characteristics and mass media exposure.

This paper contributes in several ways. First, I revisit Taiwan's family planning programs and emphasize the obtainment of contraceptive knowledge and resultant family planning attitudes. I specifically focus on the association between mass media exposure, interpersonal communication, and contraceptive knowledge. Finally, this paper investigates whether contraceptive knowledge transformed practice and furthered the policy goal--birth control--that most previous studies have not considered.

This paper is structured as follows: Section 2 presents the background of Taiwan's family planning programs. Section 3 contains the literature review. Section 4 introduces the data that this paper uses. Section 5 focuses on the trends of contraceptive knowledge over time. Section 6 contains the identification strategy. Section 7 presents the results. Section 8 concludes the study.

2. Taiwan's Family Planning Programs: Background

Taiwan's death rate fell from about 14 to 5 per thousand between 1948 and 1962, but the fertility rate remained the same. High fertility rates and low death rates lead to an annual rate of population growth that reached 3.5 per cent in the years between 1951 and 1956. The 3.5 per cent growth rate would lead to the doubling of the population in only 20 years (Freedman and Takeshita, 1969). Social and economic development might change the role of the traditional family and decrease the demand for children. However,

it usually takes years to complete the transition from high mortality and fertility to low mortality and fertility. Therefore, Taiwan's family planning programs were implemented nationwide to slow down population growth and shorten the period of demographic transition to prevent a large population growth that might impede economic development.

Taiwan's family planning programs were enacted nationwide in 1964. Before 1964 there were some voluntary and quasi-governmental activities in advocating family planning. For example, in 1950 the Joint Commission for Rural Reconstruction (JCRR) issued one million copies of the pamphlet, "The Happy Family," advocating family planning by the rhythm method. In 1954, the China Family Planning Association, a voluntary organization subsidized by the JCRR, organized a training program emphasizing birth control and child spacing for women living in the dependent villages (Freedman et al., 1994).

Around 1963 and 1964, there was an experimental study in Taichung city to test the effectiveness of a more intensive family planning program. This study established that many families are interested in family planning and couples in all social strata would accept contraceptive techniques when they were offered. The success of the program provided support for a later nationwide family intervention. In 1969, the government started a nationwide five-year plan, with a grant of US $24 million, to reduce the fertility rate by persuading 600,000 women to use contraceptives for their family planning needs (Freedman et al., 1994).

The program involved 300 female health workers who made motivational and educational visits to women of childbearing age in their homes to offer subsidized contraceptives (Freedman et al., 1994). Since the number of pre-pregnancy health

workers was limited, they concentrated first on visiting families with more than three children, those with sons, those living in high-fertility counties, the poor, and those living in remote villages. The reason was that these women had a stronger motivation to accept contraception, and it would most effectively lower the fertility rate.

The family planning program also used public media, such as radio, TV, newspapers, and slides at Taiwan's movie houses to explain contraceptive techniques and where contraceptives could be obtained. Articles on family planning were clipped out every month from 15 of Taiwan's 22 newspapers. In 1965 there were a total of 319 articles related to family planning (Chu, 1966). In addition, around 50,000 posters were printed and placed in villages around the island.

The government also used financial incentives to encourage women to use contraception. When new kinds of contraceptive techniques were introduced, the government also updated their method of subsidizing contraceptives. The government first encouraged using loop and subsidized half of the cost; then they started to encourage using contraceptive pills and condoms and compensated the costs. In addition to the government's subsidization of sterilization surgery for the poor, each city government also used welfare funding to subsidize sterilization surgery for the general popuation (Freedman et al., 1994). The number of people undergoing sterilization surgery rose rapidly. As shown in Table 1, contraceptive-use prevalence among women aged 20-44 was 29% in 1965, it reached to 70% in 1975, and finally reached 92% in 1985. Contraceptive use was more prevalent after the implementation of the family planning programs and hence we can see that the family planning programs may have successfully increased the use of contraceptives.

3. Literature Review

There have been several studies investigating the relationship between knowledge and behaviors applied to different interests, such as nutrition, health, and fertility. Some focus on the determinant of the specific knowledge acquisition, such as the knowledge of health-related risks from smoking, obesity, and HIV/AIDS. Others focus on the association between acquired knowledge and behavior. This section categorizes the literature based on the way they identify the effect information the roles of mass media exposure, social network, schooling, and policy interventions.

3.1 The Literature Related to the Determinant of Knowledge Acquisition

3.1.1 The role of mass media exposure

Kan and Tsai (2004) used Taiwanese data (cardiovascular disease risk factors two township study in Taiwan, 5 years repeated cross-sectional survey between 1990 to 2000) to examine the association between obesity risk knowledge and obesity. They found that people who are intensely exposed to mass media—for example, they regularly read newspapers, or watch TV news broadcasts—are more likely to acquire information about obesity-related risks. In addition, people who actively participate in community activities or frequently meet friends are more likely to obtain obesity risk knowledge through interpersonal interactions.

Aggarwal and Rous (2006) used data from India to deeply examine the determinants of women's knowledge regarding HIV/AIDS. They break the knowledge accumulation process into two parts. One is the awareness of the disease, measured by

whether the respondent has ever heard about the disease, and the other is the quality of the disease, measured by the number of modes of transmission the respondent can correctly identify. They point out that an individual's knowledge acquisition is determined by the demand and supply constraints of knowledge. The supply constraints of knowledge acquisition are determined by cognitive ability, availability of health information through various channels, and characteristics of local environment. However, the above determinants are independent of one another. For example, a highly educated person in a village with no access to media or other sources of information may know little about the disease. Therefore, they investigate further by examining the interaction of education with media exposure and other factors related to local environment. They find that education plays the most important role in both the awareness and the quality of HIV/AIDS knowledge. However, providing illiterate women with TV increased their awareness as much as if they had completed middle school. They find that mass media exposure might improve the awareness but not the quality of health-related knowledge. However, due to data limitation, this paper does not look further at whether people transformed their knowledge into new behaviors.

Barber and Axinn (2004) investigate the mass media as a tool for social change that shapes individual behavior primarily via attitudinal change. They argue that the mass media is likely to influence family formation behavior because it shapes two specific aspects of self-identity: (1) attitudes and preferences regarding family size, and (2) decisions regarding the implementation of those preferences. They hypothesize that exposure to mass media (such as listening to the radio, watching a movie or TV, or reading the newspaper) will be associated with smaller family size, greater acceptance of

contraceptive methods, and higher contraception rates to limit family size. They find that media exposure affects attitudes about childbearing—for example, family size preference, the idea that having many children is better than being rich, the idea that a man with no children cannot go to heaven, the preference for sons, attitudes toward contraceptive use, and permanent contraceptive use (sterilization and IUD)—which are likely to shape fertility limitation behavior in this setting.

3.1.2 The role of social networks

Montgomery and Casterline (1993) use Taiwan-Fukien Demographic Fact Book registration with the aggregate township level data from 1961-1981 to look at the effect of lagged fertility on fertility. This paper uses lagged fertility as the identification of diffusion effect. Lagged marital fertility has significant positive effects on current marital fertility. The authors also use 2 SLS to resolve the endogeneity issue in lagged fertility. They use lagged family planning inputs and lagged demographic characteristics to estimate the lagged fertility, and use the predicted lagged fertility from the equation to examine the effect on current fertility.

Behrman et al. (2002) look at the effect of social network on women and men's contraceptive practice, using panel data from rural Kenya. They use the number of people in a respondent's network who used contraception in the lagged period as the identification of social network and examine its effect on contraceptive use in the current period. They find that social networks have significant and substantial effects even when they controlled for unobserved factors that may also determine the nature of the social network. Also, the author found that the effects of social networks are nonlinear and

asymmetric. The effects are particular large when at least one network partner is perceived to be using contraceptives; the inclusion of additional networks partners with the same characteristic generally has much smaller effects.

3.1.3 The role of schooling

Ippolito and Mathios (1999) examine the association between information about fiber and cereal consumption. They use the removal of the health-claims ban as the identification of information acquisition. They find that education, income, health behavior, and other demographics affected people's acquisition and processing of health information. Production of information depends on the efficiency in processing information, costs of acquiring information, and the value individuals place on health.

de Walque (2002) examines the effect of education on health behavior when acquired information plays a crucial role. He uses data from Uganda and finds that at the beginning of the HIV/AIDS epidemic, educated women were at greater risk of being infected by HIV/AIDS, but later this positive gradient between HIV prevalence and education disappeared, because highly educated individuals were more likely to alter their sexual behavior when the information about risk in sexual behavior became widespread.

de Walque (2002) use retrospective data to look at the prevalence of smoking in the U.S. from 1940 to 2000. He finds that in 1940, individuals with less than a high school degree are the least likely to smoke, while the other three education categories are all similar in their rates of smoking. By 2000, there is a clear negative gradient between educational achievement and smoking prevalence. Using retrospective data, he shows

that educated people reacted more quickly and more strongly to the information about the health-damaging consequences of smoking. He mentions that there are three channels through which education affects health behaviors: 1. education is an investment for the future and therefore gives the right incentives for individuals to protect their health; 2. education enters as a factor in the health production function by giving better access to information and by helping to process that information; and 3. health and education are both caused by a third underlying variable, an unobservable like ability or the discount factor.

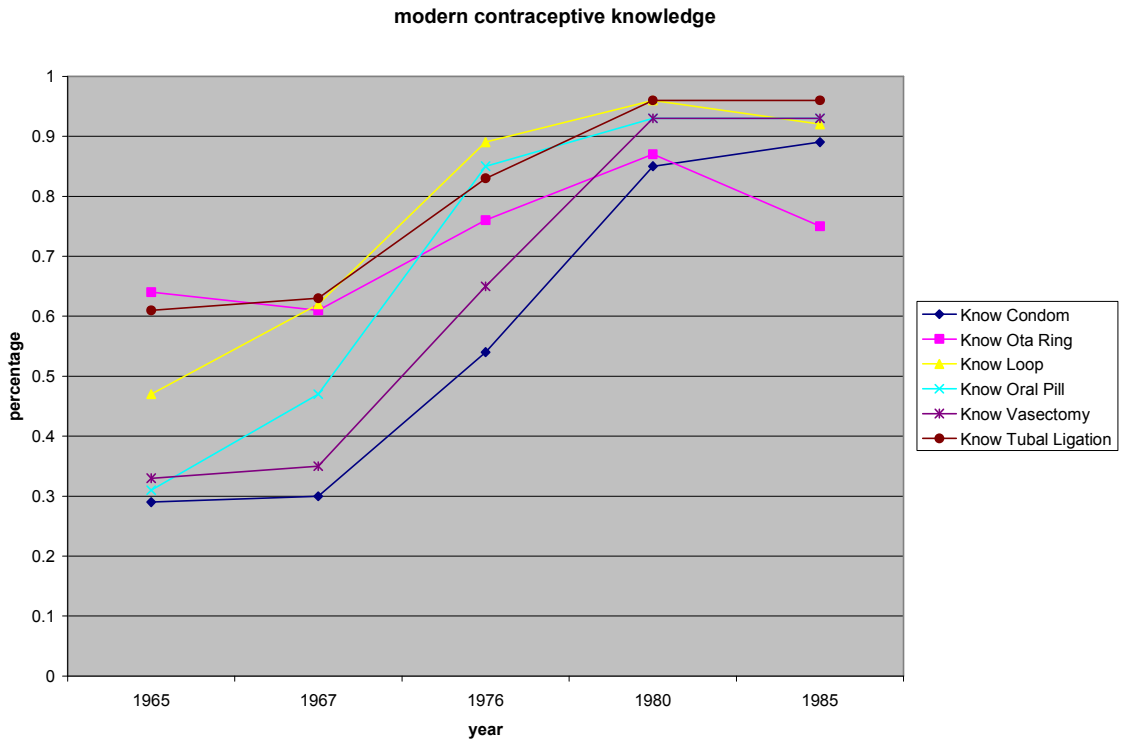
Rosenzweig and Schultz (1989) focus on the effect of schooling on non-market productivity, such as contraceptive practice and efficiency. This study tests the hypotheses that (1) educated couples are able to use contraceptives more effectively than less educated couples; (2) schooling-related differences in contraceptive effectiveness and knowledge are greater for those contraceptives that are neither prescribed nor installed by health professionals; and (3) educated couples are more able than less educated couples to lessen the effects of exogenous biological traits or supply constraints on their fertility. However, because contraceptive information acquisition may in part reflect the demand for children, all variables relevant to demand, not just schooling, could in principle be included in the information accumulation function. Rosenzweig and Schultz collect information on the intended number of births, and they use it to capture the effect of the demand for children on contraceptive information acquisition.

4. Data

This research is primarily based on data from five island-wide surveys,

"Knowledge, Attitudes, and Practice of Contraception in Taiwan" (KAP). They are repeated cross-sectional data conducted respectively in 1965, 1967, 1976, 1980, and 1985.[2] These surveys interview married women between the ages of 20-44. Information includes women's fertility history, desired number of children, and attitudes toward, knowledge of, and use of contraception. In addition, measures of socioeconomic status and demographic information such as age, education, employment, and family history for both wives and husbands are covered in this data set.

5. Modern Contraceptive Knowledge: 1960s-1980s



In the KAP data set, interviewers asked women whether they had heard of each specific modern contraceptive technique. The figure shows the pattern of knowledge for each

[2] I do not include KAP 3 data, because the nature of KAP 3 is different from the other sets of KAP. KAP 3 re-interviewed half of the respondents interviewed in 1967.

specific contraceptive in 1965, 1967, 1976, 1980, and 1985. Overall, knowledge of each contraceptive technique increases over time, except for the ota ring and loop. In 1965, the first year of the family planning programs, knowledge of ota ring, loop, and tubal ligation was more widespread than knowledge of oral pills, condom, and vasectomy. The pattern of knowledge for each contraceptive technique also reflects the way family planning intervention worked. Ota ring, loop, and tubal ligation were the contraceptive techniques that the family planning programs introduced at the beginning. After the 1970s, the family planning program started to introduce oral pills, condoms, and vasectomy. In 1965, 60% of the married women knew about condoms and tubal ligation, 45% knew about the loop, and only 30% of them knew about condoms, oral pills, or vasectomy. However, in the 1980s, around 90% of women knew each kind of contraceptive.

6. Identification Strategy and Empirical Method

An individual's acquired information is jointly determined by factors related to his/her demand and supply constraint for information. Socio-economic characteristics and unobserved heterogeneity factors might lead to different access to and processing of information which affects health behaviors and ultimately health outcomes. These difficulties make identifying the causal effect of knowledge challenging. Some studies measure individuals' information acquisition about issues and examine their behaviors according to different information acquisition (for example, Kenkel, 1991; Kan and Tsai, 2004; Nayga, 2000); others focus on a shock event, such as the removal of the ban on nutrition claims on products and advertising campaigns, to examine different reactions

among different subgroups toward the new information (for example, deWalque, 2004; Ippolito and Mathios, 1999).

Indeed, contraceptive information acquisition might in part reflect the demand for children (Rosenzweig and Schultz, 1989) and thus unobserved individual heterogeneity might determine both contraceptive knowledge and fertility. Therefore, the coefficient of contraceptive knowledge in the fertility equation does not reflect the causal effect of information on behaviors. For example, women who have achieved their desired number of children might seek out more contraceptive techniques to effectively prevent more children; women who have specific sex preferences for children might be more informed about contraceptive techniques in order to achieve their demands; finally, more "modern" women might be more resourceful about diverse contraceptive techniques and demand fewer children.

To resolve problems of endogeneity, the two-stage least squared approach is used and the contraceptive knowledge is treated as an endogenous explanatory variable in the fertility equation. In the first stage, contraceptive knowledge is treated as a dependent variable; this stage uses mass media exposure and outside organization participation as the instruments of contraceptive knowledge, which are believed to be highly correlated with contraceptive knowledge acquisition but not correlated with fertility. The hypothesis is that the married women who regularly listen to the radio, watch TV, or read magazines and newspapers are more likely to have access to contraceptive advertisements and family planning campaigns and, hence, to obtain more contraceptive information. Married women who actively participate in outside organizations have broader social

networks and, hence, are more likely to obtain information through word-of-mouth communication.

In the second-stage of 2SLS, the predicted value of contraceptive knowledge is treated as an independent variable in the fertility equation. Since the unobserved individual heterogeneity related to fertility is removed, the coefficient of predicted contraceptive knowledge in the fertility equation truly reflects the effect of contraceptive knowledge on fertility. In addition, I include regional fixed effects to capture the regional unobserved factors which might be associated with fertility, such as preferences for large numbers of children or sex parity. In fact, price and income are the fundamental factors which determine women's demand for children. I include several individual socioeconomic characteristics, such as schooling, husband's schooling, household income, and women's working status in the fertility equation.

First, I used the OLS model to estimate the fertility equation (1) without considering the possible endogeneity issue. N_i refers to the number of live births the woman *i* has given; K_i is the number of contraceptive techniques the woman *i* has ever heard of; X_i refers to other independent variables, such as women's age, age squared, years of schooling, husband's years of schooling, household income, women's current working status, whether living in a city, whether living with parents-in-law, etc.

$$N_i = \beta_0 + \beta_1 K_i + \beta_2 X_i + \varepsilon_i \qquad \textbf{(1)}$$

Furthermore, in order to control for the endogeneity issue, I use the 2SLS approach: first, I use mass media exposure and organization participation as the instruments to identify the effect of contraceptive knowledge in equation (2), and then I use the predicted value of contraceptive knowledge from (2) to estimate the effect of

contraceptive knowledge in the fertility equation (3). The variables whether the respondents regularly watch TV, listen to the radio, read the newspapers, or read the magazines are proxies for exposure to the fertility-related campaigns and contraceptive advertisements in the mass media. The variables whether the respondents live with other married couples or whether they participate in community organizations are proxies for exposure to contraceptive knowledge through social networks (word-of-mouth communication). The hypotheses are the following: married women who regularly watch TV, listen to the radio, read magazines, or read newspapers are more likely to be exposed to the family planning campaigns, modern contraceptive knowledge, and the sources for procuring contraceptives; women who live with other married couples and participate in community organizations or activities are more likely to get contraceptive-related information from interpersonal communications.

$$K_i = \gamma_0 + \gamma_1 IV1_i + \gamma_2 IV2_i + \gamma_3 IV3_i + \gamma_4 IV4_i + \gamma_5 IV5_i + \gamma_6 X_i + \nu_i \quad (2)$$

$$N_i = \beta_0 + \beta_1 \hat{K}_i + \beta_2 X_i + \varepsilon_i \quad (3)$$

In equation (2), K_i is the number of contraceptive techniques the respondent knows. IVs refer to several instrumental variables. $IV1_i$ is whether the respondent regularly reads newspapers; $IV2_i$ is whether the respondent regularly listens to the radio; $IV3_i$ is whether the respondent regularly watches TV; $IV4_i$ is whether the respondent regularly reads magazines; $IV5_i$ is whether the respondent lives with another married couple; $IV6_i$ is whether the respondent participates in any community activities or organizations. In equation (3), N_i is the number of live births and $\hat{K}_i$ is the predicted value of the contraceptive knowledge gotten from (2). X refers to demographic and socioeconomic

characteristics, such as age, age squared, years of schooling, husband's years of schooling, women's labor market participation, whether or not the couple is living with the husband's parents, whether they live in a urban or rural area, whether they have any sons, and their household income.

7. Results

(1) OLS regression:

Table 2 presents results from the ordinary least square model using the 1965, 1967, 1976, 1980, and 1985 cross-sections from the KAP. This is the simplest specification without considering the endogeneity of contraceptive knowledge. The dependent variable is the number of live births. Independent variables are listed in the first column, which includes couples without sons, contraceptive knowledge, woman's age, age squared, whether the woman is working outside of the family, years of schooling, husband's years of schooling, ethnicity, whether living in a city, whether living with husband's parents, and household income. In addition, the model control for geographic fixed effects and standard errors are clustered by the geographic location.

In general, the associations between women's socioeconomic characteristics and fertility are consistent over time. Older women have more live births than younger ones, and the gradient of age and fertility decreases over age. The women who do not have any sons have fewer births. The women who have the higher opportunity cost of raising children: working outside of the family, higher educated have less number of births. Husband's years of schooling are also negatively associated with fertility. Ethnicity matters: the women who immigrated from mainland China (or whose fathers immigrated

from mainland China) have fewer births compared with Fukiennese. Women living in a city have fewer births. Household income is not significantly associated with fertility.

In the 1965, 1967, and 1976 cross-sections, contraceptive knowledge is positively associated with the number of live births. Knowing one more contraceptive technique is associated with an increase in fertility by 0.07, 0.05, and 0.02 live births in 1965, 1967, and 1976 respectively. In the 1980 cross-section, contraceptive knowledge is negatively associated with the number of live births. In the 1985 cross-section, the association between knowledge and fertility is negative but not statistically significant. The simple ordinary least square model does not take into consideration the endogeneity in contraceptive knowledge, the coefficient on contraceptive knowledge; therefore, it only presents the association between knowledge and fertility rather than the effect of contraceptive knowledge on fertility.

(2) 2SLS results:

To resolve the endogeneity of contraceptive knowledge, a two-stage methodology is used and treats contraceptive knowledge as an endogenous variable in the fertility equation. In the first stage, the ordinary least square is used to estimate a contraceptive knowledge equation. Table 3 presents the result of the first stage. The predicted value of contraceptive knowledge from the first-stage regressions is treated as an explanatory variable in the second-stage estimation of fertility equations. The result of the second stage is listed in Table 4. In the first stage, mass media exposure and social networks are used as proxies for contraceptive knowledge. These proxy variables for mass media exposure include whether the respondent regularly watches TV, listens to the radio, or

reads newspapers or magazines. The proxy variables for social network include whether the respondent is living with other married couples and whether the respondent participates in any community organizations or activities. The F statistics for each cross-sectional regression is over 10. The instrumental variables of contraceptive knowledge are powerful.

In the second stage, the number of live births is the dependent variable, and the predicted value of contraceptive knowledge from the first stage is treated as an explanatory variable. Table 4 presents the results of the second stage. In 1965 and 1967, the early years of the implementation of the family planning programs, the effect of contraceptive knowledge on fertility is negative but not statistically significant. In the later years of the family planning programs, 1976, 1980, and 1985, the effect of contraceptive knowledge on fertility starts to be negative and statistically significant. Knowing one more contraceptive technique decreases the number of live births by 0.14, 0.12, and 0.27, respectively. The socioeconomic characteristics are significantly associated with number of births. Older women have more births, but the gradient of age and births decreases as age increases. Women who do not have sons have fewer births. The women with high opportunity cost of giving births or raising children: working outside of the family have fewer number of births. Women who are originally from mainland China or live in the city have fewer births. Since the contraceptive knowledge is usually confounding with years of schooling. After controlling for contraceptive knowledge, women's years of schooling and husbands' years of schooling are still negatively associated with fertility. One more year of women's schooling is associated with a decrease of fertility by 0.04, 0.03, and 0.03 in 1967, 1976, and 1980 respectively.

Household income is positively associated with number of births. The associations are positive and statistically significant in 1976 and 1985.

8. Conclusion

Taiwan's family planning programs, enacted nationwide in 1964, aim to decrease women's fertility and control the population growth, changing fertility demand by educating citizens in population growth issues and disseminating knowledge of modern contraceptive methods to married couples to attain fertility control. This paper examines the effect of contraceptive knowledge on fertility, and focuses on the period right after the family planning programs were enacted. In order to take into consideration the endogeneity of contraceptive knowledge in the fertility equation, this study uses the two-stage least square approach. Mass media exposure and social networks are the proxies for the acquired contraceptive knowledge. This paper found that mass media exposure and social networks are positively associated with the number of contraceptive techniques known. That is, women who regularly watch TV, listen to the radio, or read newspapers and magazines are more likely to be exposed to contraceptive-related information. Similarly, women who participate in women's organization are more likely to obtain contraceptive information from word-of-mouth communication.

Price and income are the fundamental factors influencing the demand. In the fertility equation, women's working status, years of schooling, and the price (opportunity cost) of having children are negatively associated with the number of births; income (household income) is positively associated with the number of births. Demographic characteristics, such as ethnicity, age, and residency with parents-in-law are significantly

associated with the number of births. The effect of contraceptive knowledge is negative and it is statistically significant in the later years of the family planning programs. In 1976, 1980, and 1985, knowing one more contraceptive technique decreases the number of live births by 0.14, 0.12, and 0.27, respectively.

This paper helps to gauge the effect of knowledge on behavior. There have been a large number of studies looking at health knowledge and behaviors, such as HIV/AIDS, smoking, and obesity, but very few focus on contraceptive knowledge and fertility. This study fills the gap in the relationship between knowledge and behavior.

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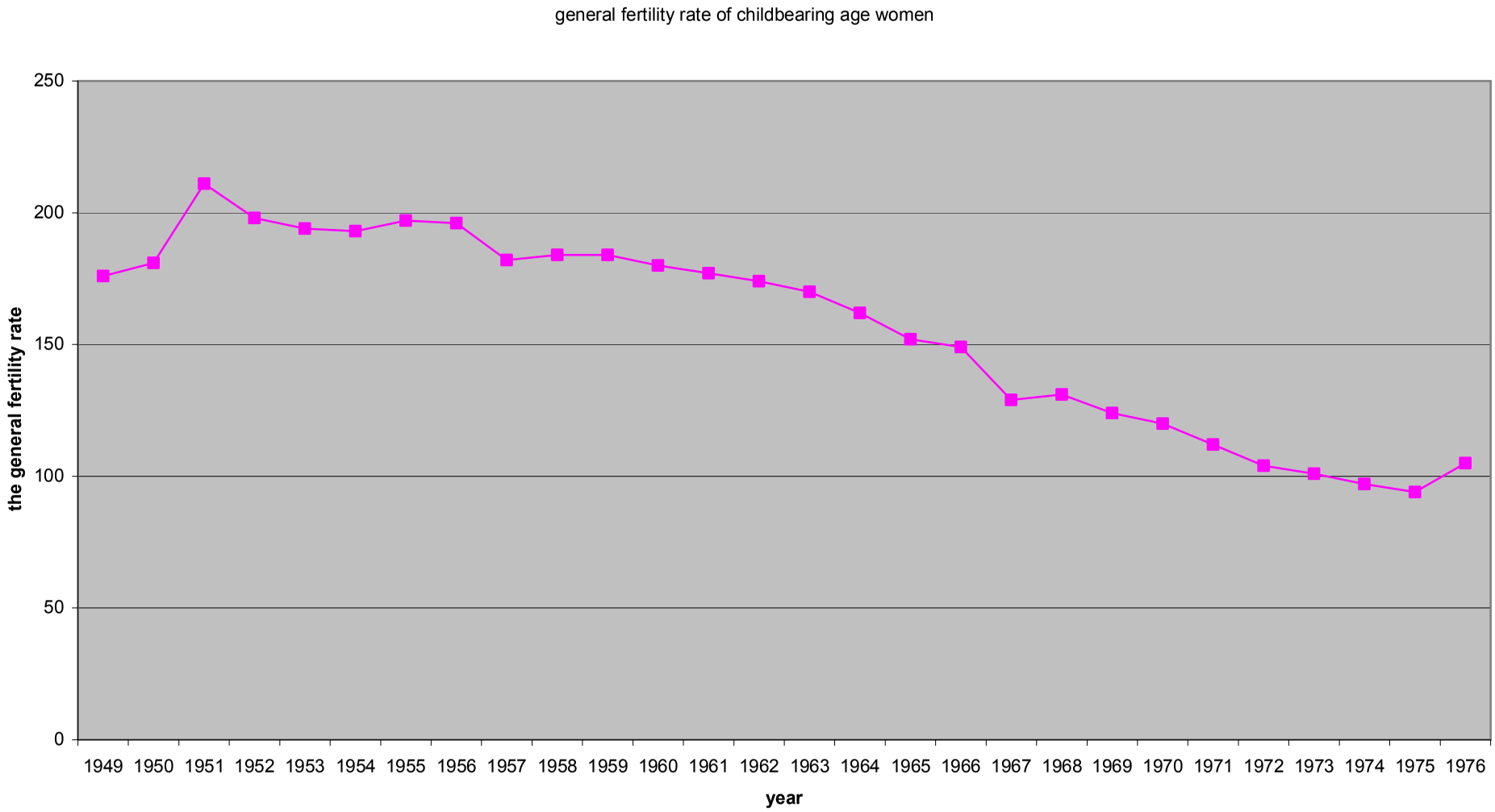
general fertility rate of childbearing age women
250
200
150
100
50
0
the general fertility rate
1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976
year

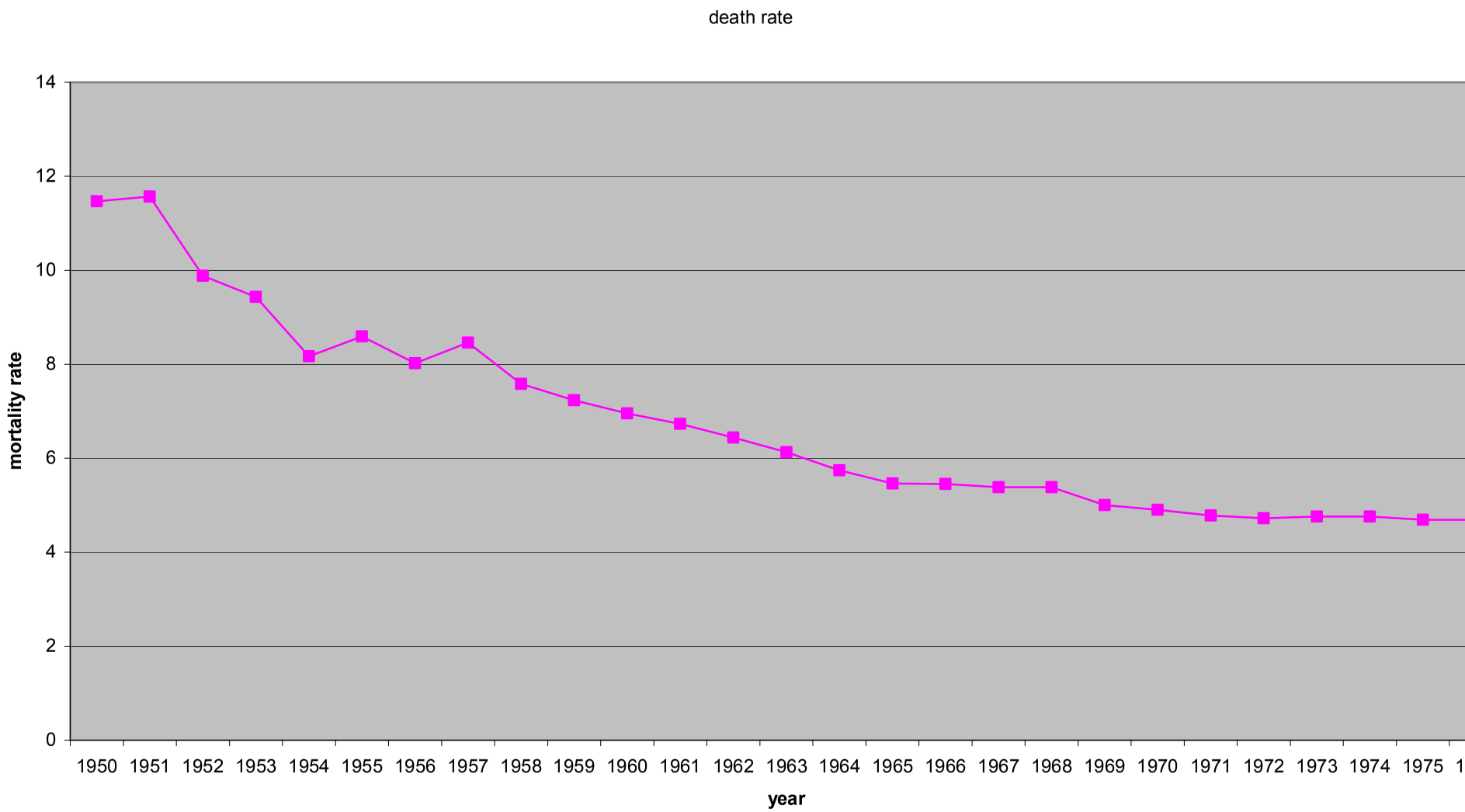
death rate
mortality rate
14
12
10
8
6
4
2
0
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975
year

Table 1: Summary statistics

	KAP 1 (1965)	KAP 2 (1967)	KAP 4 (1976)	KAP 5 (1980)	KAP 6(1985)
Sample size	3,719	4,989	5,587	3,852	3,819
Dependent variable(mean)					
Number of living births	4.04	3.96	3.20	2.70	2.66
Ideal number of births	3.96	3.89	3.25	2.84	2.57
Abortion	0.10	0.12	0.20	0.23	0.28
Number of abortion	1.57	1.60	1.57	1.60	1.54
Number of contraceptive techniques known	3.53	4.00	6.15	8.05	7.97
Contraception practice	0.27	0.41	0.68	0.83	0.88
Independent variable					
IVs					
Whether the respondent reads the newspaper often	**0.14**	**0.21**	**0.29**	**0.51**	**0.62**
Whether the respondent reads magazines often			**0.11**	**0.16**	**0.22**
Whether the respondent listens to the radio often		**0.54**	**0.15**	**0.27**	**0.49**
Whether the respondent watches the TV often		**0.21**	**0.70**	**0.79**	**0.93**
Does the respondent own a Radio	**0.55**				
Whether living with other married couples	**0.27**	**0.28**	**0.16**	**0.10**	**0.11**
Organization participation			0.15	0.06	0.06
No son	0.18	0.15	0.18	0.20	0.18
Women's years of schooling	3.13	3.56	4.85	6.61	7.77
Women's Education level					
Illiterate	0.49	0.40	0.25	0.12	0.08
Elementary	0.41	0.49	0.59	0.58	0.48
Junior high	0.06	0.06	0.08	0.11	0.17
Senior high	0.03	0.04	0.05	0.13	0.21
College	0.01	0.01	0.02	0.06	0.06
Husband's years of schooling	5.78	6.19	7.32	8.60	9.26
Whether working outside of family	0.17	0.20	0.44	0.31	0.33
Whether living with parents or parent's in law	0.52	0.46	0.39	0.38	0.40
Women's age	31.95	32.15	33.49	30.70	32.20
Living in city dummy	0.30	0.31	0.43	0.47	0.50
Women's ethnicity (Fukiennese)	0.81	0.79	0.80	0.79	0.81

(Hakka)	0.16	0.15	0.14	0.13	0.14
(Mainlander)	0.03	0.04	0.03	0.05	0.05

Table Continued

	KAP 1 (1965)	KAP 2 (1967)	KAP 4 (1976)	KAP 5 (1980)	KAP 6(1985)
Sample size	3,719	4,989	5,587	3,852	4,312
Contraceptive Knowledge					
Know Condom	0.29	0.30	0.54	0.85	0.89
Know Foam Tablets	0.29	0.28	0.29	0.36	0.24
Know Jelly	0.17	0.15	0.23	0.35	0.26
Know Diaphragm	0.12	0.14	0.19	0.35	0.38
Know Rhythm	0.20	0.27	0.45	0.60	0.67
Know Basic Temperature	0.05	0.09	0.20	0.43	0.53
Know Coitus Interruption	0.04	0.08	0.24	0.45	0.50
Know Ota Ring	0.64	0.61	0.76	0.87	0.75
Know Loop	0.47	0.62	0.89	0.96	0.92
Know Oral Pill	0.31	0.47	0.85	0.93	0.93
Know Vasectomy	0.33	0.35	0.65	0.93	0.93
Know Tubal Ligation	0.61	0.63	0.83	0.96	0.96

Note: Since KAP3 re-interviews the respondents in KAP2, KAP3 only includes fertility history after the year 1967. I need to identify the same person in KAP 2 and KAP 3, so that I can know their total number of births. I've already applied for the serial number and geo codes from Population Studies Center in U of Michigan and will get the data soon.

Table 2

OLS Model, dependent variable: number of living births. (geographic fixed effects)					
	1965	1967	1976	1980	1985
noson	-1.41	-1.58	-1.09	-0.93	-0.87
	[0.10]**	[0.09]**	[0.06]**	[0.05]**	[0.05]**
c_k	0.07	0.05	0.02	-0.02	-0.01
	[0.01]**	[0.01]**	[0.01]**	[0.01]*	[0.01]
wife_age	0.41	0.30	0.29	0.34	0.22
	[0.05]**	[0.04]**	[0.04]**	[0.04]**	[0.02]**
wife_age2	-0.29	-0.14	-0.21	-0.36	-0.22
	[0.08]**	[0.07]*	[0.06]**	[0.06]**	[0.04]**
wife_out	-0.27	-0.21	-0.15	-0.12	-0.21
	[0.07]**	[0.06]**	[0.04]**	[0.04]**	[0.04]**
wife_edu	-0.05	-0.06	-0.07	-0.05	-0.05
	[0.01]**	[0.01]**	[0.01]**	[0.01]**	[0.01]**
hus_edu	-0.07	-0.04	-0.04	-0.05	-0.05
	[0.01]**	[0.01]**	[0.01]**	[0.01]**	[0.01]**
hakka	-0.05	-0.13	-0.03	-0.06	-0.05
	[0.10]	[0.09]	[0.06]	[0.05]	[0.04]
mainland	-0.90	-0.42	-0.23	-0.15	-0.14
	[0.19]**	[0.16]**	[0.07]**	[0.06]*	[0.06]*
city	-0.67	-0.25	-0.18	-0.19	-0.22
	[0.15]**	[0.10]*	[0.07]*	[0.07]**	[0.05]**
livewithpm	0.02	0.06	0.08	0.08	0.06
	[0.05]	[0.05]	[0.04]+	[0.04]*	[0.04]
hus_income		-0.04	0.01	-0.01	-0.00
		[0.04]	[0.01]	[0.04]	[0.03]
Constant	-4.96	-2.61	-3.06	-3.30	-0.99
	[0.73]**	[0.67]**	[0.70]**	[0.53]**	[0.39]*
Observations	3652	4851	4666	3850	3812
R-squared	0.58	0.54	0.51	0.49	0.47

Robust standard errors in brackets
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 3

2SLS, first stage, dependent variable: number of contraceptive techniques known. (geographic fixed effects)					
	1965	1967	1976	1980	1985
noson	-0.84	-0.79	-0.58	0.00	-0.14
	[0.14]**	[0.12]**	[0.12]**	[0.13]	[0.09]
wife_age	0.53	0.58	0.53	0.32	0.08
	[0.09]**	[0.07]**	[0.10]**	[0.12]*	[0.05]
wife_age2	-0.79	-0.85	-0.75	-0.47	-0.16
	[0.14]**	[0.10]**	[0.14]**	[0.20]*	[0.08]*
wife_out	0.05	0.22	0.16	0.03	0.18
	[0.14]	[0.11]*	[0.13]	[0.13]	[0.10]+
wife_edu	0.19	0.16	0.15	0.14	0.19
	[0.02]**	[0.02]**	[0.02]**	[0.02]**	[0.02]**
hus_edu	0.12	0.12	0.11	0.09	0.10
	[0.02]**	[0.01]**	[0.02]**	[0.02]**	[0.01]**
hakka	0.70	0.40	0.84	-0.15	0.24
	[0.31]*	[0.15]**	[0.28]**	[0.26]	[0.15]
mainland	-0.01	-0.02	-0.07	-0.36	-0.23
	[0.27]	[0.25]	[0.26]	[0.19]+	[0.18]
city	-0.20	0.62	0.54	0.01	0.76
	[0.46]	[0.18]**	[0.36]	[0.24]	[0.29]*
livewithpm	-0.23	-0.29	-0.28	0.01	0.08
	[0.09]*	[0.09]**	[0.09]**	[0.08]	[0.09]
l_radio	0.32	0.79	0.47	0.20	0.26
	[0.10]**	[0.09]**	[0.13]**	[0.11]+	[0.09]**
read_news	1.83	1.48	1.02	0.80	0.96
	[0.23]**	[0.16]**	[0.13]**	[0.16]**	[0.13]**
live_r	0.04	-0.12	-0.36	-0.07	-0.07
	[0.11]	[0.09]	[0.16]*	[0.13]	[0.10]
hus_income		0.46	0.08	0.33	0.20
		[0.07]**	[0.02]**	[0.10]**	[0.08]*
w_tv		0.70	0.76	0.31	-0.05
		[0.13]**	[0.12]**	[0.13]*	[0.15]
read_mag			0.82	0.76	0.44
			[0.15]**	[0.13]**	[0.08]**
org			0.46	0.34	0.47
			[0.18]*	[0.19]+	[0.16]**
Constant	-5.67	-8.97	-8.75	-0.38	3.96
	[1.45]**	[1.06]**	[1.64]**	[1.82]	[0.93]**
Observations	3652	4848	4666	3850	3814
F ratio					
R-squared	0.39	0.44	0.41	0.32	0.36

Robust standard errors in brackets
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4

2SLS, second stage, dependent variable: number of living births. Geographic fixed effects					
	1965	1967	1976	1980	1985
c_k	-0.31	-0.03	-0.14	-0.12	-0.27
	[0.19]	[0.04]	[0.03]**	[0.05]*	[0.06]**
noson	-1.71	-1.64	-1.18	-0.93	-0.90
	[0.17]**	[0.07]**	[0.06]**	[0.05]**	[0.05]**
wife_age	0.59	0.34	0.38	0.37	0.25
	[0.10]**	[0.04]**	[0.05]**	[0.04]**	[0.03]**
wife_age2	-0.56	-0.21	-0.33	-0.41	-0.27
	[0.15]**	[0.07]**	[0.07]**	[0.07]**	[0.05]**
wife_out	-0.22	-0.19	-0.13	-0.12	-0.19
	[0.08]**	[0.06]**	[0.05]**	[0.04]**	[0.04]**
wife_edu	0.05	-0.04	-0.03	-0.03	0.02
	[0.05]	[0.01]**	[0.01]**	[0.01]*	[0.02]
hus_edu	-0.00	-0.02	-0.01	-0.04	-0.02
	[0.03]	[0.01]*	[0.01]+	[0.01]**	[0.01]+
hakka	0.19	-0.10	0.12	-0.07	0.03
	[0.15]	[0.08]	[0.07]+	[0.06]	[0.06]
mainland	-0.87	-0.41	-0.20	-0.18	-0.21
	[0.19]**	[0.12]**	[0.11]+	[0.09]*	[0.09]*
city	-0.73	-0.20	-0.04	-0.18	-0.00
	[0.12]**	[0.10]*	[0.07]	[0.06]**	[0.08]
livewithpm	-0.08	0.03	0.02	0.08	0.07
	[0.08]	[0.05]	[0.04]	[0.04]*	[0.04]+
hus_income		0.01	0.03	0.03	0.08
		[0.05]	[0.01]**	[0.04]	[0.04]*
Constant	-6.86	-3.26	-4.54	-3.32	-0.07
	[1.27]**	[0.71]**	[0.83]**	[0.61]**	[0.56]
Observations	3652	4849	4666	3850	3812
R-squared	0.42	0.53	0.44	0.46	0.26

Standard errors in brackets
+ significant at 10%; * significant at 5%; ** significant at 1%