

Intercultural Marriage and Its Impact on Fertility in Taiwan

(Draft)

Yu-Hua Chen

yuhuac@ntu.edu.tw

Department of Agricultural Extension
Center for Population and Gender Studies
National Taiwan University

Abstract

Although spousal resemblance on educations and occupations has increased in Taiwanese society, the official statistics do show a delay in the age at first marriage and fewer marriages among women in particular. Many blue-collar male workers and farmers have been suffered more from these changes in the marriage market. With stronger demands to form family, to have descendants and to support elders, these men are more likely to adopt intercultural marriages of which most wives come from mainland China and Southeast Asia. The first part of this paper describes major changes in marital behaviors and attitudes among Taiwanese, following by a discussion on their direct and indirect influence on fertility. Then, the reasons accounting for the emergence of intercultural marriages are examined on the basis of the 2003 *Survey of Foreign and Mainland Chinese Spouses' Living Condition*. A comparison regarding reproduction outcomes between Taiwanese and non-Taiwanese women is provided in the final part of this paper. These findings show foreign spouses from Southeast Asian countries actually have reproduced more children than other marriage immigrants. The data also evidence mainland Chinese spouses are more likely to be childless. More importantly, the traditional preference for son is even more obvious among intercultural marriages.

Introduction

Only a few decades ago, families were viewed as the primary societal units in Taiwan, and the interests of individuals were generally secondary to those of the family. To extend the family lineage into the future through childbearing, the early and universal marriage was regarded to as a typical feature in the process of family formation. Within the intergenerational coresiding unit, elders were accorded great respect and exercised extensive authority over younger family members and grown up children had the duty to support and help their parents (Thornton & Lin, 1994). After undergoing a rapid socioeconomic transformation, however, major family characteristics from formation to dissolution throughout the life cycle have changed tremendously. Of these changes, it is obvious that changing marital behavior has alarmed most Taiwanese people, and already attracted attention from both policy makers and scholars because of its lasting effects on fertility and age structure of the population in the near future.

The Western scholars argue that individuals expect a great deal of personal fulfillment from marriage and are willing to forego marriage unless such expectations are met. People who hold this view often believe that other relationships such as cohabitation are acceptable alternatives to marriage (Popenoe, 1993). Still others contend that we are witnessing a temporary retreat from marriage due to changes related to expectations regarding equality between men and women. They think that marriage will make a come back as young people adjust to egalitarian expectations of marriage (Nock, 2001). At present, as mentioned by Cherlin (2004, p.858), “marriage is no longer as dominant as it once was, but it remains important on a symbolic level. It has been transformed from a familial and community institution to an individualized, choice-based achievement.” While an unsettled debate is continuing in the industrial societies and Giddens (1992) even foresee that marriage has already become merely one of many relationships, there is hardly a clear narrative regarding the current state of marriage and its likely future in the East settings.

According to major national surveys, young Taiwanese are continually revealing their strong propensity to marry and form a family. However, the official statistics have improved a gradual postponement of marriage among younger and well-educated women in their twenties and early thirties. This social reality demonstrates the meaning of marriage per se is changing somewhat in the whole society. One question that remains from this crucial social phenomenon is whether the women with higher education and steady career aspiration will eventually enter marriage. A study targeting Hong Kong women suggests that, if women are able to negotiate an adequate division of labor in the household and to combine career and family as well, both economic potentials and expectations have led women to postpone but not abandon marriage (Wong, 2003). If this argument is valid, we may assume the decrease in female first marriage rates recently as a result of tempo effect caused by delaying marriage. The implementation of

family-friendly policies and promotion of egalitarian ideology would be able to encourage higher-educated and working women entering marriage and beginning childbearing. In the end, an enormous turnover in marriage might be possible.

Since Taiwanese women may be likely to enter marriage at older ages, it becomes relative difficult for those who prepare to marry earlier or socio-economically less favorable men to search for potential partners. As a result, the intercultural marriage emerges as another alternative and being adopted rapidly in non-metro areas. Would intercultural marriages change the family formation fundamentally? Or, would it be an appropriate solution for low fertility? At this moment, there is no clear conclusion on these questions. In this paper, I first delineate the transition of union formation both in practices and in attitudes recently. Next, the trend and reasons accounting for the emergence of intercultural marriages are explained. The third part is devoted to presenting the reproductive behaviors and their determinants of foreign and mainland Chinese spouses. The change in major features of marriage and its implication on fertility are discussed in the final section.

The Changing Practices and Attitudes of Union Formation

Taiwanese marriage system has long been characterized by the overwhelming power of parents. The compatibility between two marrying families in terms of socioeconomic status, cultural background and the implied value system was seen as the top priority in marriage match (Yi & Hsung, 1994). Hence, marriage was a process of agreements and rituals rather than an event, and a family-based decision rather than a personal choice. Due to these concerns, most parents arranged and directed marriages for their children and the idea that prospective partners should come from similar backgrounds has been maintained for decades. However, the increase in educational attainment adding by more pre-marital employment and off-family living experiences together have changed inmate relationships and interactions between young adults and their parents. Undoubtedly, these changes should have an effect on the way to form a union and the marriage eventually.

According to the series of KAP survey data, the percentage of parent-arranged marriages declined from over 60% for the birth cohort of 1933-34 to slightly more than 10% for the birth cohort of 1960-64 (Thornton & Lin, 1994). The latest survey conducted in 1998 showed, for 1970-80 birth cohort, only 3.2% of marriages were arranged and decided by Taiwanese parents (BHP, 2005). The 2001 *Taiwan Social Change Survey*, a nation-wide representative data set, indicated that more than 50% of all marriages were decided entirely by couples themselves (Chang & Fu, 2002). While young adults get involved in the mate selection process by their own social networks, parents continue to have a crucial role in the marriage process. At least, a great majority of young Taiwanese still marry someone with parental approval.

The prevalence and timing of marriage in Taiwan have also been greatly changed during the past century. In 1905, 47.3% of Taiwanese women aged 15-19 had married and most men married by their middle twenties. At age 30 and above, the number of women who had been married was 99% or greater (Thornton & Lin, 1994). Marriage was nearly universal among Taiwanese in the first half of the twentieth century. Following an influx of mainland Chinese in the late 1940s, this universal trend began to be disturbed. Among this wave of immigrants there were a substantial number of unmarried young men in the military. The imbalanced sex ratio at this period produced a marriage squeeze, making it uneasy for man, in particular for veterans, to find a potential partner.

As shown in Table 1, there were 42.5 % of single men in 1976, with only 31.2 % of single women. At the same period, the marriage was still universal among women who were thirty years old and over. This substantial difference of singlehood between genders has been narrowed down in recent years because of the natural replacement of population itself and the adoption of foreign spouses, a newly emerging marital and family phenomenon which is discussed in the later section. Another noteworthy change is revealed from this table, too. While the proportion of single men have decreased continuously, a crucial turning point related to a gradual increment in single women can be traced back to the beginning of the 1990s.

Table 1. The Marital Status of 15 Years and Over by Sex in Taiwan: 1956-2005

	Single		Married		Divorced		Widowed	
	M	W	M	W	M	W	M	W
1956 ^a	40.1	29.5	55.1	58.3	1.0	0.9	3.7	11.3
1966 ^a	47.7	33.6	48.0	56.4	1.7	1.2	2.6	8.8
1976	42.5	31.2	54.3	60.7	0.9	0.9	2.3	7.2
1981	40.6	30.4	56.0	61.5	1.2	1.1	2.2	6.9
1986	39.0	27.7	57.0	61.7	1.7	1.6	2.3	6.9
1991	38.0	29.6	57.2	61.0	2.4	2.4	2.5	7.1
1996	38.3	30.0	56.4	58.9	3.1	3.3	2.2	7.8
2001	37.4	30.4	56.0	56.3	4.3	4.8	2.3	8.6
2005	37.5	31.1	54.7	53.6	5.5	6.1	2.3	9.2

Note: ^aData of 1956 and 1966 referring to those who were 12 years and over.

Source: Department of Household Registration Affairs, Ministry of the Interior, Executive Yuan, Taiwan, ROC.

Although it has been argued that women's economic independence status gives working women more capability to reject dysfunctional marriages in most industrial countries (Bianchi, Subaiya, & Kahn, 1999), there is no sufficient evidence in supporting this association because of

a relatively low labor force participation rate of married Taiwanese women. The official statistics indicate the crude divorce rate has increased more than six times in the last 30 years, from 0.9 couples per thousand persons in 1976 to 6.1 in 2005. The crude marriage rate shows a tendency of decrease after reaching an all-time high of 9.6 couples per thousand persons in 1981 due to most baby boomers arriving at marriage ages, and then the rate has fallen to 5.7 in 2005.

The economic and social changes have led to late marriage in Taiwanese society. By the end of 2005, the median age of first marriage reaches 27.6 years for women and 30.7 years for men. The official statistics also show that a growing number of men and women in their thirties have never married (Table 2). The single population being an unconventional choice has caught much attention. A closer scrutiny from the earlier and latest demographic data shows the proportion of women in their early 30s who had never married increased from 12.3% in 1976 to 41.2% in 2005. While this may only be a continuation of the shift toward late marriage, it may also represent the beginning of a trend toward lifelong singleness. Will Taiwanese eventually enter marriage or abandon marriage? Table 3 presents the other indirect evidence. Until 1996, the marriage was still prevalent and no significant gender difference across age groups. Yet, the beginning of the twenty-first century has been marked by an unusual change that men become more likely to hold married status following the increase in age. On the contrary, the proportion of married Taiwanese women is decreasing dramatically with aging in recent years.

Table 2. Single Population by Sex and Age Groups, 1971-2005

Age group	1976	1981	1986	1991	1996	2001	2005
Men							
25-29	39.9	41.1	48.7	57.6	64.6	71.3	76.8
30-34	12.3	13.7	17.3	24.4	31.7	36.5	41.2
35-39	7.2	7.1	8.2	11.3	15.8	18.7	21.0
40-44	7.1	5.4	5.7	7.0	8.9	11.3	12.7
Women							
25-29	17.1	19.7	24.6	33.1	40.5	50.7	59.1
30-34	5.2	8.1	9.8	12.9	16.4	22.2	26.9
35-39	3.0	4.0	6.0	7.7	9.1	12.1	14.8
40-44	2.3	2.8	3.6	5.6	6.6	7.9	9.5

Source: 1976-2004 Taiwan-Fuchien Demographic Fact Book Republic of China.

Table 3. Married Population by Sex and Age Groups, 1971-2005

Age group	1976	1981	1986	1991	1996	2001	2005
Men							
25-29	59.5	58.0	50.1	41.2	33.9	26.5	20.9
30-34	86.4	84.5	80.2	72.3	64.8	58.7	53.2
35-39	90.9	90.5	88.4	83.9	78.8	74.5	70.9
40-44	90.1	91.9	90.4	87.6	84.4	80.4	77.8
45-49	82.7	90.0	90.8	88.5	87.3	83.8	81.3
50-54	75.2	76.4	78.4	79.3	88.8	86.4	84.2
55-59					89.1	87.9	86.4
Women							
25-29	81.5	78.5	73.1	64.5	56.7	45.4	36.6
30-34	92.6	89.0	86.4	82.4	78.2	71.1	65.4
35-39	93.8	92.2	88.9	85.9	83.0	78.5	74.8
40-44	92.9	92.1	90.2	86.4	83.3	80.1	77.3
45-49	89.6	90.2	89.2	86.4	83.1	79.8	77.7
50-54	64.1	66.9	68.6	69.6	83.0	79.0	76.9
55-59					80.2	77.7	75.4

Source: 1976-2004 Taiwan-Fuchien Demographic Fact Book Republic of China.

1. Educational homogamy

The overall educational attainment of women has reached a record high in the past ten years. At the end of 2004, almost 60% of college students and 50.6% of university students were women, while the sex ratio of those aged 15 to 24 years old Taiwanese was 106 in the same year. Two decades earlier, the figures were only 37.3% and 36.4%, respectively. As shown in Figure1, nowadays there are even more women studying in the advanced education following another wave of expansion in graduate programs. Correspondent to the advancement of women's education, a large number of women have been entering the labor force (Yi, 2002). The female labor force participation rate rises from 40.4% in 1984 to 47.7% in 2004. For married women, the increase is even more evident from 35.5% to 47.8%.

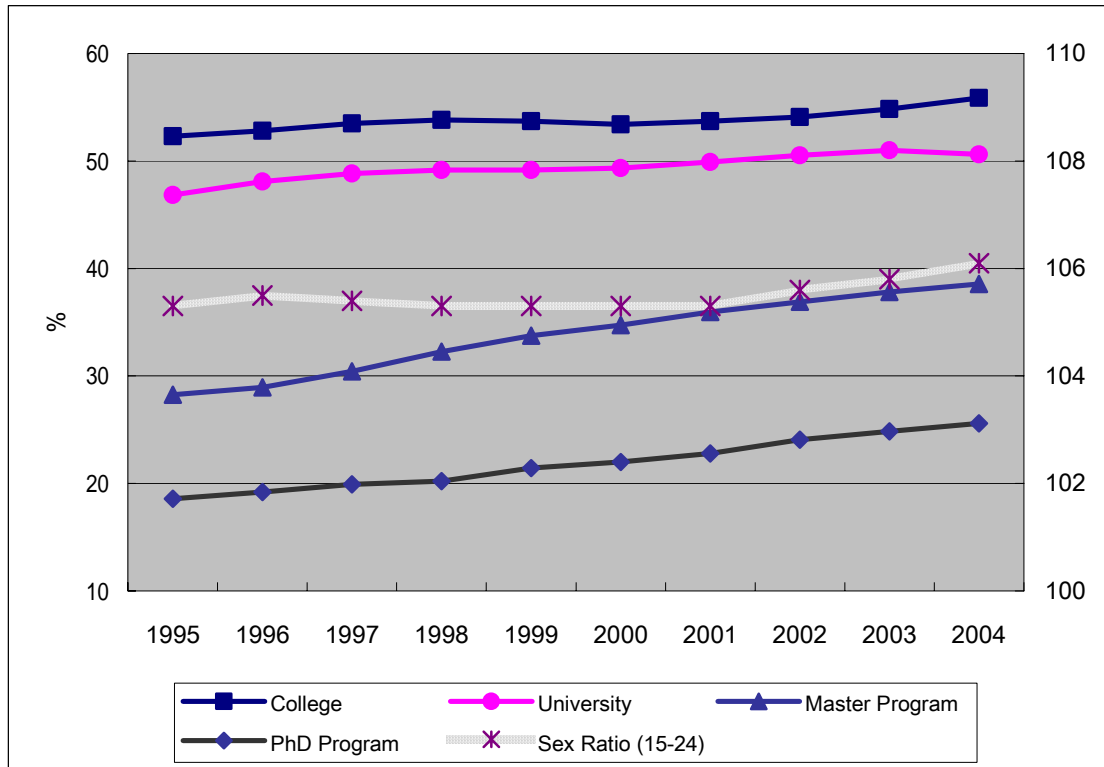


Figure 1. The Proportion of Female Students in Higher Education and Sex Ratio of Aged 15-24 Taiwanese, 1995-2004.

The extent of difficulty to cross social strata to marriage between people with different levels of educational attainments has been taken as an indicator of societal openness (Ultee & Luijkx, 1990). In this regard, it is suspected that the traditional Chinese norm of family compatibility in the marriage match may lose its importance in the modern Taiwanese society. Comparing the 1975 and 1990 data, Raymo and Xie (2000) suggest there was an overall trend toward increased educational heterogeneity in Taiwan. With more educational opportunities available for women, scholars also find that marriage becomes less frequent as distance in schooling increases (Tsai, 1996; Tsay, 1996). With speedy increment in education especially for women, the cross tabulation analysis of husband's and wife's education (in Table 4) shows that 28% of wives have higher education than that of their husbands in 2003, while 20 years ago this figure was only 22%. It should be pointed out that although the strength of ethnic homogamy has decreased overtime (Tsai, 1996), a positive association between husband's and wife's social classes is still found (Tsay, 1996).

Table 4. Crosstabulations of Husband's and Wife's Education, 1983 and 2003

1983		Grooms					
Brides	College	Senior	Junior	Elementary	Illiteracy	subtotal	
College	0.05	0.02	0.01	0.00	0.00	0.09	
Senior	0.07	0.13	0.06	0.03	0.01	0.29	
Junior	0.02	0.09	0.11	0.06	0.01	0.29	
Elementary	0.01	0.05	0.09	0.10	0.02	0.27	
Illiteracy	0.00	0.01	0.02	0.02	0.01	0.06	
subtotal	0.15	0.30	0.28	0.22	0.05	1.00	

2003		Grooms					
Brides	University	College	Senior	Junior	Elementary	subtotal	
University	0.09	0.02	0.02	0.01	0.00	0.15	
College	0.04	0.06	0.05	0.02	0.01	0.17	
Senior	0.03	0.05	0.15	0.08	0.03	0.34	
Junior	0.01	0.02	0.08	0.09	0.04	0.23	
Elementary	0.01	0.01	0.04	0.04	0.03	0.11	
subtotal	0.18	0.16	0.34	0.23	0.10	1.00	

Source: 1983 and 2003 Taiwan-Fuchien Demographic Fact Book Republic of China.

2. Changing attitudes toward marriage and gender roles

Unlike older women who were more likely to act upon social and cultural norms, younger generations are making every endeavor to pursue higher education and to commit themselves in the labor force as their male counterparts. However, it is far from obvious that how the majority of Taiwanese view women's productive and reproductive roles. According to three waves of *The Taiwan Social Change Survey* (Chang & Fu, 2002), Table 5 represents the attitudinal change on gender roles in the past decade. As can be seen, while there is still substantial uncertainty about women being a breadwinner rather than a homemaker, women's employment is actually encouraged and its possible negative consequence to family life has been somewhat devalued. Specifically, as most of other countries, 64.0% agree that employed mother is harmful to her pre-school children (a 9% increase in 10 years). But regarding woman herself, 51.0% reports full-time job will interfere women's family life (a 9.7% drop in 10 years), and 76.3% agrees that having a job is the best way to become independent for women (a 11.2% rise in 10 years). It is clear that by 2001, the public has accepted a young mother with employment, although only half will endorse her job as a major role for her as well as for the family.

Table 5. Change of Attitudes on Gender Roles among Taiwanese: 1991, 1996 and 2001

	Agreement (%)		
	1991	1996	2001
▪ If a mother were employed outside the household, it would have negative impact on her pre-schooling kids.	54.8	71.6	64.0
▪ The family life of working woman will always be interfered by her full-time job.	60.7	60.4	51.0
▪ For women, it is more meaningful to be a breadwinner than a homemaker.	37.8	43.1	49.9
▪ For women, the best way becoming independent is to have a job.	65.1	71.8	76.3
▪ Husband's major role is a breadwinner and wife, a care-giver.	54.6	56.1	50.7

Source: Taiwan Social Change Survey, Office of Survey Research, Academia Sinica, Taipei, Taiwan.

3. Late marriage and fertility

The beginning of significant fertility decline in Taiwan occurred in the late 1950s, but this demographic trend actually accelerated after the introduction of the family planning program in the early 1960s (Figure 2). While the program was appraised as a success because it considered the receptivity of population to family planning as well as the importance of diffusion of new ideas within society since formally launched in 1964, both officials and scholars are evaluating its long-lasting impact on adults' reproductive attitudes and practices which may be attributed to Taiwan's low fertility rates in recent years.

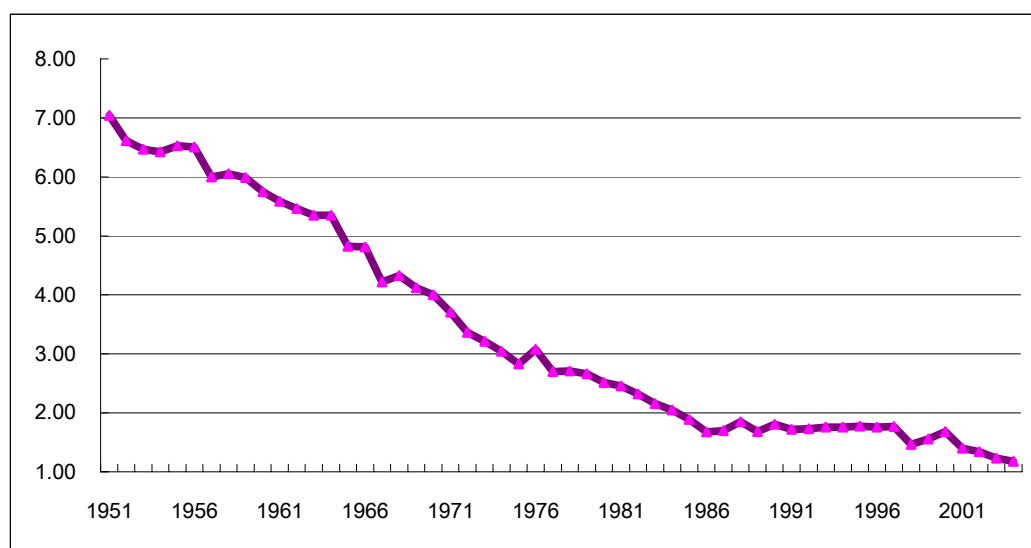


Figure 2. Declining Total Fertility Rates of Taiwan Population, 1951-2004

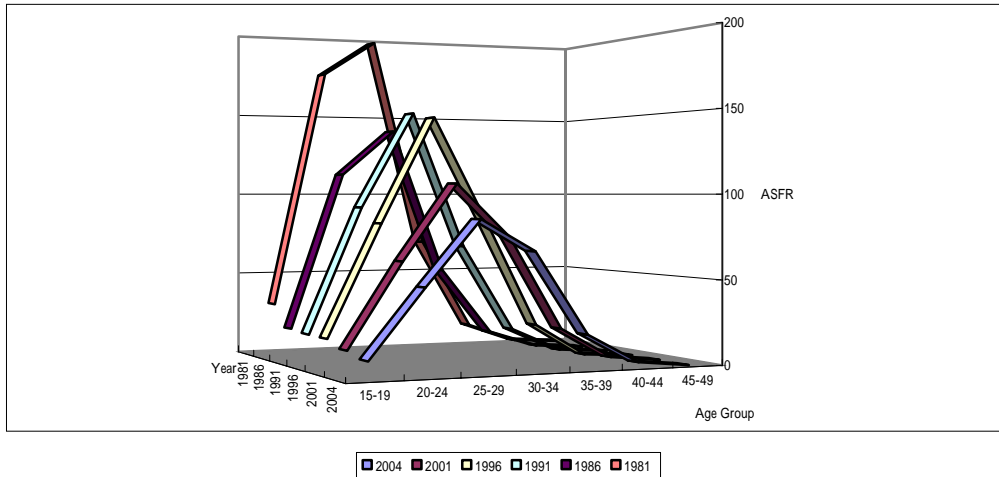


Figure 3. Age Specific Fertility Rates Per Thousand Childbearing Women Aged 15-49, 1981-2004

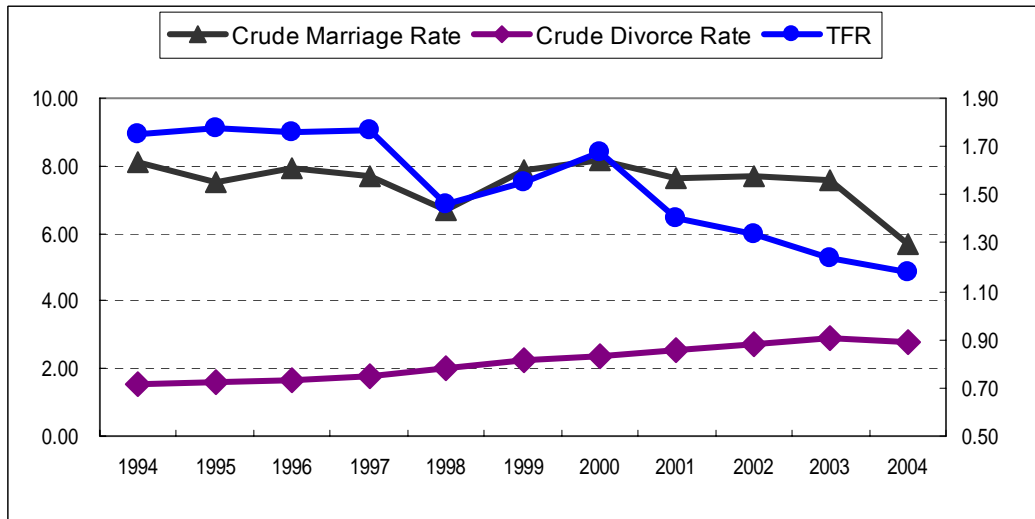


Figure 4. Total Fertility Rates, Crude Marriage Rates and Crude Divorce Rates of Taiwan Population, 1994-2004

In 1994, the official statistics show there were a total of 322,938 newborns, but ten years later there were only 216,419 babies. Referring to the total fertility rate of year 2004, each Taiwanese woman at childbearing ages was estimated to give births to 1.18 babies on average. Longer education, delayed marriages, and relatively fewer potential mothers between ages of 20 and 34 together have led to a reducing birth rate (Figure 3). Additionally, Figure 4 shows an interesting relationship of total fertility rates, crude marriage and divorce rates of Taiwan population. Fluctuations in total fertility rates are significantly correlated to crude marriage rates in recent years with a sharp decline in 1998 (the year of Tiger of the Chinese Zodiac—a year earmarked for disasters, particularly a bad year for marriage) and a sudden increase in 2000 (the year of Dragon—a desirable year for marriage and birth in the family). While total fertility rates

continued declining afterwards, the marriage rates resumed to relatively normal range except year 2004. The divorce rates, on the contrary, have revealed a stable increase since 1994.

According to the KAP surveys, the mean preferred number of children of married women was 4.0 in 1965, while the latest survey conducted in 2002 found the figure has decreased to an average of 2.0. Despite a decrease in the preference for sons ever recorded (Thornton & Lin, 1994), the preference of male descendant is recurrent again as young newlyweds favor only one child for economic and lifestyle concerns. Among the 216,419 births registered in 2004, there were 110 baby boys for every 100 girls. This figure tells a clear story that strong son preference is still existent among Taiwanese parents and may result in an unnatural gender imbalance in the near future. With the advancement in new reproductive technologies, a very low fertility rate is theoretically compatible with the strong son preference. However, the social cost of the resultant imbalanced sex ratio deserves serious attention. Living in a context of patriarchal cultural norms, to have a male heir remains to be a prevailing family trajectory for Taiwanese families.

The Emergence of Intercultural Marriage

Only a few decades ago, intermarriages were mainly found among unions between local women and male mainlanders who migrated to the Island in the aftermath of the Chinese Civil War and relatively few cases between Taiwanese and their American or Japanese partners. Although the culture line in marriage nevertheless remains strong in the society, the amount of intercultural marriages has increased dramatically since the mid 1980s. The appearance of this social phenomenon could be attributed to the stronger demand of family formation and descendants sharing by two groups, old veterans and socioeconomically less favorable men. With the lifting of martial law in 1987, the government adopted a more open policy toward China and the travel permission across the Taiwan Strait was granted. This change first offered another possibility for old veterans who were still single or widowed to get marry with mainland Chinese (Chao, 2002).

Due to unequal allocation of resources and infrastructure, most rural and hilly areas have long been suffered considerable loss of young women from rural to urban migration. The lack of marriageable women in farming villages became a driving force to introduce the first wave of *foreign brides* from Indonesia in the late 1970s. Because of more educational and employment opportunities available for women after the economic takeoff and demographic transition, the female socioeconomic status has been enhanced significantly which in turn leads single women to further postpone marriage. The very existence of assortative matching on education prevents those socially and economically disadvantage men from meeting suitable partners in the marriage market. Thus, there were more marriage migrants move to Taiwan from Thailand, Philippine in the 1980s, and recently from Vietnam and Cambodia (Hsia, 2000).

Beginning from the late 1990s, the brokered marriage and foreign brides accompanying with their newborns begin to frequently occupy the headlines of mass media. Particularly, a major worry for the policy makers is related to the fact that more newborns are likely to be mothered by so-called foreign brides. In terms of mother's nationality, among 205,854 newborns in 2005, there are 5.2% who are mothered by mainlanders and 6.8% by Southeastern Asians. As shown on the Table 6, in 1998 intercultural marriages accounted for only 16 % of all newlywed couples, and the figure soared to approximately 32 % in 2003. To decelerate the growth of marriage immigration and to prevent fake marriage (i.e. trafficking in women), a variety of legal restrictions and penalties were implemented from the beginning of year 2004.¹ In particular, there is no guarantee of legal status towards marriage immigrants until they can pass a face-to-face interview holding either at the checkpoints of major airports or in their home countries. Accordingly, the proportion of non-Taiwanese spouses slightly decreased to 25.1% and 19.5% by 2004 and 2005, respectively.

Table 6. Annual Number of Registered Marriages and The Distribution of Spouse's Nationality: 1998 to 2005

Year	All Marriages	Spouse's Nationality		
		Taiwanese	Mainlander	Foreigner
1998	140,010	84.4	8.5	7.1
1999	175,905	81.4	10.1	8.5
2000	183,028	75.2	13.0	11.8
2001	167,157	72.8	16.4	10.8
2002	173,343	71.6	17.0	11.4
2003	173,065	68.6	19.9	11.5
2004	129,274	74.9	9.4	15.7
2005	142,082	80.5	10.1	9.4

Source: MOI Statistical Information Service, Department of Statistics, Ministry of the Interior, Executive Yuan, Taiwan, ROC. Data retrieved from <http://www.moi.gov.tw/stat/>

¹ The *Act Governing Relations between Peoples of the Taiwan Area and the Mainland Area* has been revised to include harsher punishments for trafficking in immigrants. The Immigration Office of National Police Agency has also strengthened on-line and post-entry interviews of Mainland Chinese spouses and other applicants for visit, stay and residence in Taiwan area. According to the 2005 annual report, the Office has interviewed 85,726 Mainlanders with nearly one-third of interviewees being deported back to the Mainland. Moreover, regulations require mainland Chinese spouses applying for a national identification card to pass a security clearance. In September 2005, a regulation was implemented requiring fingerprinting of all mainland Chinese who are spouses of Taiwan nationals, visiting relatives, or are seeking residency in Taiwan. For foreign spouses, particularly from Southeastern Asian countries, conventional group interview has been replaced by one-to-one interview on June 2005.

According to the latest official statistics from the Ministry of the Interior, by 2005 there are approximately 365,000 non-Taiwanese spouses, 35.9% of Southeastern Asian and 64.1% of mainland Chinese immigrant spouses. Among them, 90% are females. In terms of residential distribution, mainlander spouses are more likely to settle down in major metropolitan areas including Taipei, Taichung, Kaoshiung and adjacent areas, where on average are highly concentrated by residents who came to Taiwan after the Civil War. In contrast, spouses from several Southeastern Asian countries are more likely to marry people in rural and hilly areas in which most residents are so-called Fukienese and Hakka who have been settled in Taiwan for more than hundred years.

Reproductive Behaviors of Foreign and Mainland Chinese Spouses

Since both proportions of marriage migrants and newborns have been on the rise at the beginning of the 21st century, the government has initiated a nation-wide survey in 2003. The *Survey of Living Conditions of Foreign and Mainland Chinese Spouses* was intended to collect data on the population and on the needs of so-called foreign brides in Taiwan. The sample consisted of 240,837 foreign and Mainland Chinese spouses who were granted citizenship or alien residency permits between Jan 1987 and Aug 2003. In essence, the scale of this survey was close to universe survey or census of all registered marriage immigrants. Hundreds of civil workers who had received interview training went to field for data collecting from Oct 17 to Nov 7 in 2003. In spite of having double check of all official records and assigning civil workers as interviewers, however, of the 240,834 listed respondents, 175,894 were actually interviewed, yielding a total response rate of 73%. Among nonresponse cases, they were more likely to be mainland Chinese spouses than other origins. The reasons for nonresponse were mainly related to divorce, separation and residential movement.

Regardless of a moderate response rate, this data set provides sufficient information on detailed individual fertility histories, reproductive behaviors, and family formation process of intercultural marriages. Using these data, I try to verify the validity of a popular saying that “*foreign brides breed like rabbits.*” In the next analysis, I first describe the reproductive behaviors and outcomes of four groups of marriage migrants including Southeastern Asians, mainland Chinese, spouses from Hong Kong and Macau, and others. Second, by using logistic regression analysis, I examine the likelihood of childless and higher fertility of mainland Chinese and Southeastern Asian wives and explore what reasons account for fertility differentials between groups. Finally, using the same data set, I present an overview on sex ratios of newborns who are mothered by foreign and mainland Chinese spouses.

1. Reproductive outcomes, personal and marital characteristics of marriage migrants

The hypothesis that minority group status could affect reproductive behaviors was first introduced in the 1950s (van Heek, 1956) and subsequently attracted much attention. In a multi-ethnic society, minority groups might adjust their fertility to achieve either security or upward mobility as a direct response to their social disadvantage. And the fertility of minority and majority groups might become similar as social, economic, and demographic characteristics of two groups become more comparable. Goldscheider and Uhlenberg (1969) tested this *assimilationist hypothesis* and argued the characteristics interpretation of minority group fertility was limited. They offered an alternative hypothesis that “under given social and economic changes and concomitant acculturation, the insecurities and marginality associated with *minority group status* exert an independent effect on fertility (Ibid, p.372).” While there is a series of debates on the efficacy of two positions theoretically and empirically, in this paper both hypotheses are adopted and used to evidence the social reality that foreign and mainland Chinese spouses’ double disadvantage status of being marriage migrants and members of families with less favorable socioeconomic characteristics.

(Table 7 about here)

Table 7 shows a brief description on reproductive outcomes and major characteristics of foreign and mainland Chinese spouses. Since the so-called *foreign* spouses actually refer only to those from Southeastern Asian countries, it is necessary to separate them from other marriage migrants with different nationalities. Similarly, all mainlanders are divided into two groups with one from mainland China and the other from Hong Kong and Macau. In terms of reproductive behavior, the result indicates that mainland spouses are more likely to be childless (50.9%) and less likely to have two or more children. Thus, the lowest average number of children (0.71) can be attributed to childless. More than two-third of Southeastern Asian spouses have at least one child. The fertility outcomes of spouses from Hong Kong and Macau are generally similar to those spouses from other countries. When childless cases were excluded from each group, the lowest mean number of children is again related to mainland Chinese spouses (1.45) and to Southeastern Asian spouses (1.49). In contrast, spouses from Hong Kong, Macau, and other countries in fact have higher fertility rates.

Around 97 percent of Southeastern Asian and mainland Chinese spouses are female. Remarkably, the former group is consisted of relatively young marriage migrants with basic education attainment. Most of them were unemployed during the survey period. Mainland Chinese are slightly older than Southeastern Asians. Despite having higher education level, more restrictions and regulations actually prevent most mainland Chinese spouses from being formally employed. Unsurprisingly, the better human capitals are found among spouses from

Hong Kong, Macau, and other countries. Almost half of these spouses are males. As shown in Table 7, Taiwanese spouses' personal characteristics are also available for being compared across four groups. Since veterans are more likely to marry Chinese women, the descriptive statistics do reveal several signs related to this tendency. In other words, some spouses of marriage migrants from mainland China are older, unemployed, with disadvantage status (disabled or low-income). For those spouses from Southeastern Asian countries, 13 percent of them married a Taiwanese who has health and/or economic problems.

Other importance indicators for understanding the likelihood of intercultural marriages are age and education differences between spouses. It's unusual to find there are about 65 percent of intermarriages between Taiwanese and Southeastern Asians having an age gap more than ten years. A similar finding is also shown on couples of Taiwanese and mainland Chinese (52%). Regarding the education difference, the large gap is again related to Southeastern Asians and their Taiwanese spouses. The empirical literature agrees that the correlation of two spouses' education levels is in fact positive, and therefore the question boils down to an issue of the degree of homogamy over time and across countries (Ultee & Lammers, 1998). While only a few studies look at the issue of educational homogamy in the case of intercultural marriages, these studies also find support for positive assortative matching by education (Kalmijn, 1993; Qian, 1999; Qian et al., 2001). Referring to Taiwan's dataset, the results show that educational assortative matching is still prevailing, but there are more wives with higher education attainment than that of their husbands.

Two sets of characteristics in relation to marriage and residence are also included into the comparison. About 20 percent of mainland Chinese spouses reported that it's not their first marriage. On the contrary, almost all Southeastern Asians responded the first marriage and more than half of them are coresiding with parents-in-law. In terms of geographic distribution, spouses from Hong Kong, Macau, and other countries are more likely to be concentrated on metropolitan areas and northern region, following by mainland Chinese and Southeastern Asian spouses.

2. Determinants counting for childless and high fertility of non-Taiwanese spouses

All analyses in this section are restricted to female mainland Chinese and Southeastern Asian spouses only. The left panel (Model 1) in Table 8 presents the results of the logistic regression analysis comparing the likelihood of childless and having at least one child among non-Taiwanese wives, and the right panel (Model 2) reports the results of the comparison between high fertility (i.e. more than two children) and low fertility (i.e. one or two children). To verify how personal, couple and marital factors influence reproductive outcomes, determinants including non-Taiwanese wives' characteristics, age and education differences between two

spouses, husbands' minority and disadvantage statuses, as well as marital and residential information are included into the analytic models.

(Table 8 about here)

The Model 1 demonstrates that all explanatory variables are associated with non-Taiwanese wives' probability of being childless. Controlling the effects of other variables, mainland Chinese wives are in fact more likely to be childless than their Southeastern Asian counterparts. Older and less educated ones (who might belong to earlier waves marriage migrants and marry veterans) have lower possibility to give birth. Both differences between couple and husband's own characteristics explain much fertility differentials among non-Taiwanese wives, of which a wider age gap (larger than 10 years), non-traditional educational matching, unstable employment, and insecure economic conditions are significantly associated with childless. In particular, the results do evidence that husband's minority and disadvantage status have negative effects on fertility behavior. With regards to marital factors, remarriage and first year of marriage both decrease the chance of having a child within current marriage, but coresiding with parents-in law will increase the likelihood of having children. Spouses who are living in metropolitan areas, or located at northern or central regions are also more likely to be childless.

Excluding those who are childless from next analysis, the Model 2 compares variables counting for the differences between higher and lower fertility of marriage migrants. The variable of first year of marriage is taken out from the model because it is not related to high parity fertility. The results report that, for those who have at least one child, Southeastern Asian wives are more like to give more births than mainland Chinese. The effect of age deserves a more detailed discussion. While the results show that older wives have higher fertility outcomes, we have to be cautious regarding the interpretation on a positive relationship between age and fertility because many younger respondents who still have chance to give birth. However, both larger age gap and education difference between two spouses prevent the possibility of high fertility. Agricultural employment status and non-metropolitan place of residence are associated with high fertility. While minority group status decreases the likelihood of having more children, the disadvantage status has lost its power to explain fertility differentials. Last, first marriage and coresidence with parents-in-law represent a stronger propensity to have newborns.

3. A possible solution for low fertility or another problem of gender imbalance

While most Taiwanese have been concerned the *quality* of newborns from foreign and mainland Chinese mothers, it is obvious these *Sons of Taiwan* have made an important contribution to retain the total fertility rates in recent years. Despite a popular belief that more children were reproduced from foreign brides, the average number of children came from these

marriage immigrants is in fact lower than the replacement level. Some female mainland Chinese were more likely to marry older Taiwanese (i.e. veterans), who actually did not give any birth because of health and economic difficulties. Due to late and fewer marriage prevailing, the total amount of newborns from Taiwanese mothers is decreasing significantly. Nevertheless, it is clear intercultural marriages can only be adopted as temporal and partial solution for low fertility. To lift the level of total fertility rate effectively, it is necessary and urgent for policy makers to introduce new and sound family planning programs and, more importantly, to encourage single Taiwanese to marry and form family earlier in their life cycle.

In addition to the fertility rates, the public should pay attention on the other unexpected result. Based on the raw data of 2003 *Survey of Residential Foreign and Mainlander Spouses' Living Conditions*, I re-calculated sex ratios of the first birth and second birth by mother's nationality. Table 9 represents an undesired tendency of gender imbalance which is closely associated with intercultural marriages. In year 2005, the overall sex ratio in Taiwan is 1.090, with the highest ratio found in Kinmen and Matsu (two small and not populous islands, geographically close to mainland China). In terms of the birth order records on 2003 survey, for those who have given births from 1998 to 2003, the results report that a strong son preference exists among marriage migrants with no significant difference between Southeastern Asian and mainland Chinese wives. It is reasonable to assume that a couple who intend to have only one child, particularly one baby boy, might search for the assistance of sex selection techniques. Some have named this practice as *pseudo one-child strategy* (假性一胎化) which in turn has resulted in unequal sex structure of newborn population.

Table 9. Total Births and Sex Ratio at Birth by Mother's Origin in Taiwan, 1998-2003

Year	Taiwan's Total Births ^a		Sex Ratio of 1st Birth ^b		Sex Ratio of 2nd Birth	
	Number	Sex Ratio	SE Asian	Mainlander	SE Asian	Mainlander
1998	254,776	1.088	1.154	1.174	1.141	1.163
1999	270,217	1.093	1.163	1.214	1.166	1.187
2000	292,724	1.096	1.125	1.175	1.132	1.171
2001	246,381	1.087	1.198	1.158	1.093	1.114
2002	236,687	1.098	1.234	1.209	1.184	1.200
2003	217,456	1.102	1.229	1.277	1.132	1.182
2004	216,419	1.106	1.076	1.106		
2005	205,854	1.090	1.099	1.087		

Source: ^a 2003 Taiwan-Fuchien Demographic Fact Book Republic of China.

^b 2003 Survey of Residential Foreign and Mainlander Spouses' Living Conditions.

The data in the shadowed area are calculated from the Ministry of the Interior. The sex ratio is for all births, regardless of birth order.

Conclusion and Discussion

In this paper, I have represented major features of marriage, recent changes in the processes of union formation and their possible effects on fertility in Taiwanese. With a solid cultural heritage of familism, these marriage and family issues have long been regarded as most crucial topics in the academic circle. While the attitudes and practices toward elderly parental support and son preference remain constant, it is less likely to predict precisely the continuity and change in other features of the family life such as parenthood and marriage. Specifically, the trend of late marriage and the introduction of foreign brides to some extent have modified the timing and form of marriage. The former may eventually create a substantial increase in lifelong singleness and the latter has attracted plenty of attention and debates on its possible negative consequences on the family and the overall society. The low fertility rates in recent years also deserve serious attention. The government is revising its population policy and reproductive measures, whereas it is expected that the total fertility rate would remain at low level if there is no significant improvement in the major socioeconomic indicators.

The primary goal of Taiwan's population policy is to maintain a reasonable population growth and particularly to encourage young men and women to get married and raise children at *suitable* ages. The intention is clearly to prevent the population from rapid degeneration and aging. Whether Taiwan's population will continue to decline has become a complex question. According to Freedman and his colleagues, "the question of whether fertility preferences will fall further probably depends for the most part on the extent to which traditional family relationships are eroded. But even a further erosion need not carry fertility and fertility preferences to lower levels, since Taiwan's fertility is low at Western levels, which have leveled off near or below replacement levels now for some years (p. 304, Thornton & Lin, 1994)."

Another related factor is that in an age of individualism, many young people choose to be childless. Typical Chinese notions such as "producing a male heir to continue the family line," "suppressing oneself for the sake of the family" or "raising children as an insurance for old age" are no longer strong appeals to the younger generation. In response to possible population decline and aging, the government has re-adopted its old policy slogan, *Two Children Are Just Right*, and in recent years more positive measures such as birth paycheck and educational support have been proposed in order to encourage more births. Finally, at this stage, there is no sure answer for whether the women with higher educational attainment and career aspirations will eventually enter marriage. Therefore, further studies are needed to trace the process of union formation of younger cohorts.

Due to the heavy demand for foreign brides, many commercialized marriage brokerages specializing in matchmaking foreign women and Taiwan men flourished in most non-metro and

rural areas. However, existing differences in culture and value systems between two spouses have resulted in unstable marriages and high divorce rates among these commercialized marital arrangements. According to a survey targeting foreign brides who ever asked for assistance from social workers and policemen (BSA, 2002), it is shown that foreign brides are much more likely to be the victims of domestic violence than their Taiwanese counterparts. In most cases, these victims are economically disadvantageous homemakers and they lack citizenship or other resourceful information in Taiwan. The same survey also found that proficiency in Chinese appears to be a prerequisite for foreign brides to report domestic violence to seek help.

In addition to the issue of domestic violence, other major concerns regarding the influx of foreign spouses centers on their children's educational problems. Since most foreign brides are lower educated with elementary-school education and are not equipped with Chinese-language abilities, they are unable to monitor their children's school work as most Taiwanese parents do. As a consequence, these children not only have poor language skills, they often exhibit general maladjustment at school too (Hsia, 2000). The problem is even exacerbated by the inferior socioeconomic status of fathers because they are not capable to compensate the expected parental role in education either. By being away from home for extended periods of working time, children's school problem can not be solved from the inadequate family resources (Liu, 2003).

Facing related problems caused by the substantial proportion of foreign brides, the government is finally reacting and is planning to implement several new programs to help foreign spouses and their children to adjust their lives in Taiwan. Since to form marriage is a fundamental family value in Taiwan, unless the difficulty in finding spouses can be solved for the lower social classes, foreign brides will continue to have its market. It is therefore more practical to alleviate potential social problems by actively initiating various resourceful programs to these socially and economically disadvantage families.

References

- Bureau of Health Promotion, Department of Health (BHP). (2005). *Report on the 8th KAP survey*. Retrieved from <http://rds.bhp.doh.gov.tw/fileviewer?id=1473>
- Bureau of Social Affairs (BSA). (2002). *Survey report on foreign brides as victims of domestic violence in Kaohsiung County*. Kaohsiung County Government, Taiwan, ROC.
- Chang, Y.-H., & Fu, Y.-C. (Eds.) (2002). *Taiwan social change survey: Report on survey 4-2*. Institute of Sociology, Academia Sinica, Taipei, Taiwan. (in Chinese)
- Chao, A. (2002). Gender politics of cultural citizenship: A case study of marriage between mainland brides and glorious citizens in Taiwan. Paper presented at the Annual Meeting for Cultural Studies Association of Australia. January 3-5, 2003.
- Cherlin, A. (2004). The deinstitutionalization of American marriage. *Journal of Marriage and Family*, 66, 848-861.
- Giddens, A. (1992). *The transformation of intimacy*. Stanford, CA: Stanford University Press.
- Goldscheider, C., & Uhlenberg, P.H. (1969). Minority-group status and fertility. *American Journal of Sociology*, 74, 361-372.
- Hsia, H.-C. (2000). Internationalization of capital and trade in Asian women: The case of foreign brides. *Taiwan: A Radical Quarterly in Social Studies*, 39, 45-92. (in Chinese)
- Kalmijn, M. (1993). Spouse selection among the children of European immigrants: A comparison of marriage cohorts in the 1960 census. *International Migration Review*, 27, 51-78.
- Nock, S. (2001). The marriages of equally dependent spouses. *Journal of Family Issues*, 22, 756-777.
- Popenoe, D. (1993). American family decline 1960-1990: A review and appraisal. *Journal and Marriage and the Family*, 55, 527-556.
- Qian, Z. (1999) Who intermarries? Education, nativity, region, and interracial marriage, 1980 and 1990. *Journal of Comparative Family Studies*, 30, 579-597.
- Qian, Z., Blair, S. L., & Ruf, S. D. (2001). Asian American interracial and interethnic marriages: Differences by education and nativity. *International Migration Review*, 35, 557-586.
- Raymo, J. M., & Xie, Y. (2000). Temporal and regional variation in the strength of educational homogamy. *American Sociological Review*, 65, 773-781.
- Thornton, A., & Lin, H.-S. (1994). *Social change and the family in Taiwan*. Chicago: The University of Chicago Press.
- Tsai, S.-L. (1996). The relative importance of ethnicity and education in Taiwan's changing marriage market. *Proceedings of the National Science Council, ROC, Part C: Humanities and Social Sciences*, 6, 301-315.
- Tsay, R.-M. (1996). Who marries who? The association between wives' and husbands' educational attainment and class in Taiwan. *Proceedings of the National Science Council*,

ROC, Part C: Humanities and Social Sciences, 6, 258-277.

- Ultee, W. C., & Luijkx, R. (1990). Educational heterogamy and father-to-son occupational mobility in 23 industrial nations: General societal openness or compensatory strategies of reproduction? *European Sociological Review, 6*, 125-149.
- Smits, J., Ultee, W., & Lammers, J. (1998). Educational homogamy in 65 countries: An explanation of differences in openness using country-level explanatory variables. *American Sociological Review, 63*, 264–285.
- van Heek, F. (1956). Roman-Catholicism and fertility in the Netherlands: Demographic aspects of minority status. *Population Studies, 10*, 125-138.
- Wong, O. (2003). Are women postponing or abandoning marriage? Evidence from Hong Kong. *Journal of Comparative Family Studies, 34*, 531-554.
- Yi, C.-C. (2002). Taiwan's modernization: Women's changing roles. In P. Chow (Ed.), *Taiwan's modernization in global perspective* (pp. 331-359). Westport, CT: Praeger.
- Yi, C.-C., & Chen, Y.-H. (1998). Present forms and future attitudes of elderly parental support in Taiwan. *Journal of Population Studies, 19*, 1-27. (in Chinese)
- Yi, C.-C., & Hsung, R.-M. (1994). Mate selection networks and the educational assortative mating in Taiwan: An analysis of introducer. In C.-C. Yi (Ed.), *The social image of Taiwan: Social science approaches* (pp. 135-178). Sun Yat-Sen ISSP Book Series (33), Academia Sinica, Taipei, Taiwan. (in Chinese)
- Yi, C.-C., & Lu, Y.-H. (1999). Who are my family members? Lineage and marital status in the Taiwanese family. *The American Journal of Chinese Studies, 6*, 249-278.

Table 7. Descriptive Statistics for Foreign and Mainland Chinese Spouses and Their Families

	Foreigner		Chinese	
	SE Asian (78,818)	Others (3,534)	Mainlander (91,236)	HK & Macau (2,306)
<i>Reproductive Behavior</i>				
<u>Number of children</u>				
0	30.0	37.2	50.9	29.3
1	40.5	29.1	29.4	27.3
2	25.1	26.0	17.4	29.6
3	4.0	6.6	2.1	10.0
4 and over	0.4	1.1	0.2	3.8
<u>Average number of children</u>				
All sample	1.04	1.06	0.71	1.33
Childless excluded	1.49	1.68	1.45	1.88
<i>Non-Taiwanese Spouse</i>				
<u>Female</u>				
	97.1	43.9	96.6	53.3
<u>Age group</u>				
15-24	46.5	2.0	11.6	1.5
25-34	41.3	29.3	56.5	18.5
35-44	9.6	36.5	20.6	35.5
45-54	2.2	17.3	8.0	24.6
55-64	0.4	10.2	2.3	10.4
65 and over	0.1	4.6	1.1	9.5
<u>Education level</u>				
Illiteracy	3.0	0.3	2.3	3.0
Elementary	33.1	5.6	18.8	18.7
Junior high	35.7	10.3	40.9	28.3
Senior high	21.3	19.0	27.5	30.7
College	6.9	64.8	10.5	19.3
<u>Employment</u>				
Farming	2.6	0.7	0.8	0.6
Manufacturing	10.8	9.9	4.5	15.2
Service	7.7	38.5	9.0	35.6
Part-time	12.5	7.8	9.7	9.6
Unemployed	66.4	43.1	76.0	39.0

(to be continued)

Table 7. Descriptive Statistics for Foreign and Mainland Chinese Spouses and Their Families
(continued).

	Foreigner		Chinese	
	SE Asian	Others	Mainlander	HK & Macau
<i>Taiwanese spouse</i>				
<u>Age group</u>				
15-24	1.1	1.1	0.7	0.8
25-34	27.7	29.0	22.1	22.9
35-44	53.1	39.7	41.3	33.1
45-54	14.5	21.1	16.2	24.3
55-64	2.2	5.4	3.8	8.8
65 and over	1.4	3.7	15.9	10.1
<u>Education level</u>				
Illiteracy	0.6	0.2	2.1	2.0
Elementary	13.3	4.2	16.6	14.2
Junior high	41.7	7.2	29.9	23.6
Senior high	36.0	22.1	36.3	35.8
College	8.4	66.3	15.1	24.4
<u>Employment</u>				
Farming	11.6	1.9	5.5	1.2
Manufacturing	39.2	13.8	27.9	20.6
Service labor	30.0	61.2	33.1	42.7
Part-time	11.2	4.5	11.3	8.8
Unemployed	8.0	18.6	22.3	26.7
<u>Minority status</u>				
Aboriginal people	0.7	2.0	1.1	0.6
Veteran	2.1	1.8	16.5	2.8
<u>Disadvantage status</u>				
	13.1	5.0	18.4	11.1
<i>Difference between Couple</i>				
<u>Age gap</u>				
More than 10 years	64.9	18.0	52.5	13.5
0-10 years	31.1	59.3	42.6	70.2
Wife older than husband	4.0	22.7	4.9	16.3
<u>Education gap</u>				
Husband higher	47.8	21.1	39.5	33.5
Wife higher	19.8	20.0	24.8	19.0

(to be continued)

Table 7. Descriptive Statistics for Foreign and Mainland Chinese Spouses and Their Families
(continued)

	Foreigner		Chinese	
	SE Asian	Others	Mainlander	HK & Macau
<i>Marital Characteristics</i>				
<u>First marriage</u>	97.4	89.6	78.9	93.5
<u>First year of marriage</u>	29.4	13.4	30.8	23.1
<u>Co-residing w/p-in-law</u>	55.0	16.4	35.8	17.6
<i>Place of Residence</i>				
<u>Metropolitan area</u>	36.8	78.0	53.4	71.0
<u>Geographic space</u>				
Northern region	38.0	64.3	46.7	67.6
Central region	29.7	15.0	21.6	17.2
Southern region	29.7	18.5	27.8	13.6
Eastern region	2.2	2.1	3.3	1.5
Kinmen & Matsu	0.3	0.1	0.6	0.1

Table 8. Logistic Regression Results Predicting Reproductive Outcomes of Non-Taiwanese Wives as a Function of Couple and Family Characteristics

Variables	Childless		More than 2 Children	
	b	odds ratio	b	odd ratio
<i>Non-Taiwanese Wife</i>				
<u>SE Asian origin/Mainlander</u>	-0.613	0.542***	0.617	1.853***
<u>Age group</u>				
15-24	-1.592	0.203***	-3.192	0.041***
25-34	-1.792	0.167***	-1.393	0.248***
35-44	-1.160	0.314***	-0.897	0.408***
45 and over (ref.)	--	--	--	--
<u>Education level</u>				
Elementary (ref.)	--	--	--	--
Junior high	-0.110	0.896***	-0.290	0.749***
Senior high	-0.219	0.804***	-0.390	0.677***
College	-0.291	0.747***	-0.574	0.563***
<i>Difference between Couple</i>				
<u>Age gap more than 10 yrs</u>	0.130	1.139***	-0.162	0.851***
<u>Education gap</u>				
Husband higher	-0.153	0.858***	-0.262	0.769***
Similar education	-0.100	0.905***	-0.116	0.891**
Wife higher (ref.)	--	--	--	--
<u>Husband's employment</u>				
Farming	-0.568	0.567***	0.308	1.360***
Manufacturing	-0.625	0.535***	-0.062	0.940
Service labor	-0.440	0.644***	-0.118	0.888*
Part-time	-0.424	0.654***	0.095	1.100
Unemployed (ref.)	--	--	--	--
<u>Husband's minority status</u>	0.373	1.452***	-0.316	0.729**
<u>Husband's disadvantage status</u>	0.088	1.092***	0.076	1.079
<i>Marital Characteristics</i>				
<u>First marriage</u>	-1.725	0.178***	1.359	3.893***
<u>First year of marriage</u>	2.350	10.488***		
<u>Co-residing w/parents-in-law</u>	-0.547	0.579***	0.075	1.078*

(to be continued)

Table 8. Logistic Regression Results Predicting Reproductive Outcomes of Non-Taiwanese Wives as a Function of Couple and Family Characteristics (continued)

Variables	Childless		More than 2 Children	
	b	odds ratio	b	odds ratio
<i>Place of Residence</i>				
<u>Metropolitan area</u>	0.164	1.179***	-0.282	0.754***
<u>Geographic space</u>				
Northern region (ref.)	--	--	--	--
Central region	-0.003	0.997	0.141	1.151***
Southern region	-0.037	1.038*	-0.038	0.962
Eastern region	-0.088	1.092*	0.147	1.158
Kinmen & Matsu	-0.625	0.535***	1.158	3.182***
<i>Constant</i>	-2.911***		-2.446***	
Likelihood Ratio (df)	68885.11 (24) ***		3381.26 (23) ***	
Percent Concordant (%)	84.4		72.1	
Sample Size	164710		98000	

Note: The first model refers to the comparison between those who are childless and having at least one child. The second one refers to the comparison between having more than 2 children and fewer children.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$