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*Research Article*

### **Reproductive contributions of Taiwan's foreign wives from the top five source countries**

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## **Reproductive contributions of Taiwan's foreign wives from the top five source countries**

**Kao-Lee Liaw<sup>1</sup>**

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**Chien-Chia Liu<sup>3</sup>**

### **Abstract**

This research studies the reproductive contributions of Taiwan's foreign wives from China, Vietnam, Indonesia, Thailand, and the Philippines, based on applications of the multinomial logit model to the micro data of the 2003 Census of Foreign Spouses. The wives from China are found to have the lowest lifetime fertility of 1.4 children, mainly because they were more prone to marry later, have a very large spousal age gap, be separated or divorced, and have their current marriage as their second marriage. The effect of wife's educational attainment on lifetime fertility turned out to be either modest or nonexistent.

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## 1. Introduction

The economic globalization of Taiwan beginning in the 1980s was accompanied by a major societal change: a progressive internationalization of the household. This change has been subsumed by Mike Douglass as part of a broad transformation called “global householding” that has quickly spanned many areas of East and Southeast Asia in recent decades (Douglass 2006). The creation and sustainment of households at all lifecycle stages increasingly depends on short- and long-term migrations of individuals across the borders of nation-states and on their ongoing transactions (e.g., phone calls and remittances) between households in different cultural and socioeconomic settings. In the households located in Taiwan, this increasing dependence has been reflected by expanded demands for foreign domestic workers and foreign brides (Huang 2006).

According to the annual statistical reports of Ministry of the Interior (MOI 2008, 2009), the combined stock of foreign “caregivers” and “domestic helpers” employed in Taiwan increased rapidly from 17,407 persons in 1995 to 131,067 in 2005, 162,228 in 2007, and 168,429 in 2008. In 2007, there were 24,700 marriages between Taiwanese grooms and non Taiwanese brides (representing 18.3% of all marriages), and the year-end stock of the foreign brides of Taiwanese husbands had increased to 372,741 people. By the end of January 2010, this stock had increased further to 401,685, with 65.5% from China, 20.5% from Vietnam, and 6.5% from Indonesia (MOI 2010). For comparison, in 2007, there were 31,807 marriages in Japan that involved couples with a foreign wife and a Japanese husband, representing 4.4% of all marriages.<sup>4</sup>

It is worth noting that in addition to the societal forces and personal motivations behind the strong and persistent demands for, and supplies of foreign workers and foreign brides (see Huang 2006; Lan 2002; Piore 1979; Wu and Wang 2001; Yang and Tsai 2007; Yi and Chang 2006; Chen 2008; Lin 2009; Tien and Wang 2006; Jones 2007; Hsia 2005), the annual flows of such individuals are subject to the influences of the policies and manipulations of national governments, sometimes resulting in sharp fluctuations with respect to both volume and major places of origin.<sup>5</sup> In Taiwan, the abolishment of martial law in 1987, the lifting of the strict regulations against visiting relatives back in Mainland China in 1988, and the first granting of permission to the Mainland spouses of

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<sup>4</sup> Based on the data from the website of Japan's National Institute of Population and Social Security Research, <http://www.ipss.go.jp/syoushika/tohkei/Popular/>, Table 6-16 Marriages by the Nationalities of Husbands and Wives: 1965-2008), downloaded on April 25, 2010.

<sup>5</sup> Being obsessed with preserving the ethnic purity of its population, Japanese government revised the Immigration Control and Refugee Recognition Act in 1990 by offering foreign workers of Japanese descent and their family members the privileged status of “long-term residents” with the possibility of easy multiple entries to Japan and holding and changing jobs in Japan. This revision resulted in a sharp increase in the intake of laborers and their family members from Brazil and Peru (the so-called “Nikkeijin”) in the 1990s (Liaw, Ochiai and Ishikawa 2010).

Taiwanese husbands to travel to Taiwan in 1992 triggered the first wave of marriages between Mainland women and the veterans who had come to Taiwan as soldiers following the retreat of the Nationalist government to Taiwan in the late 1940s (Huang 2006). By 2003, the annual number of registered marriages involving a spouse from Mainland China reached 34,685 (with the husbands being mostly non veterans by then), which represented 20.2% of all marriages registered in that year (MOI 2008). Being concerned with the long-term implication of such a large intake of Mainland spouses on the political independence of Taiwan from China, the government of Taiwan tightened the restriction on the inflow of Mainland brides, resulting in a sharp reduction of the annual number of registered marriages with a Mainland spouse to 10,642 in 2004, which was 8.1% of all marriages registered in that year (Huang 2006; MOI 2008). Being mindful of the negative effect of too much economic and demographic integration with China on Taiwan's political independence, the government of Taiwan under the leadership of President Lee Teng-hui introduced the "Going South" policy in the early 1990s, which was designed to increase investment and foreign aid to Vietnam and other Southeast Asian countries (Wang and Hsiao 2002; Huang 2006). The enhanced economic connection was accompanied by an increasing demographic connection. In the last three years (2007-2009), Vietnam contributed about 20% of non Taiwanese brides to Taiwan, although Mainland China, benefiting from language affinity with Taiwan, remained the most important source (contributing over 60% of such brides) (MOI 2010).

Irrespective of government policies and manipulations, the causal factors on the intakes of foreign domestic workers and foreign wives can be expected to remain strong so that the internationalization of Taiwan's households can be expected to continue. We agree with Douglass (2006) that it is important to study the various effects of this process and not to be obsessed with their negative aspects.

To avoid wordiness we use the term "foreign wives" to represent those who were the wives of Taiwanese citizens and did not have Taiwanese citizenship at marriage. Thus, according to our definition, those from Mainland China (China for short), Hong Kong, and Macao are part of the pool of foreign wives, although they belong to separate categories in official statistics. Also note that in both our and official categorizations, the wives from Hong Kong and Macao are not included as part of the wives from China, because the socioeconomic connections with Taiwan have been different between Hong Kong and Macao on the one hand and Mainland China on the other.

With respect to long-term demographic effects, there is a major difference between foreign domestic workers and foreign wives. The former are introduced into Taiwan in the fashion of a revolving door (i.e., their stay in Taiwan is legally restricted to only a few years)<sup>6</sup> and hence have little direct long-term demographical effect. In contrast the latter

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<sup>6</sup> Japan and South Korea also restrict labor immigrants to stay for no more than a few years. This restriction has induced many female immigrants to use the strategy of real and fake marriages to the citizens of the host country to stay on a long-term basis and to avoid various discriminations (Piper and Roces 2003).

are legally permitted to settle down in Taiwan on a long-term basis and contribute to the reproduction of the native-born population, although some of the former have the chance of getting acquainted with a Taiwanese man and becoming a foreign wife later.

In light of their long-term demographic significance, the reproductive contributions of Taiwan's foreign wives are chosen as the focus of this paper.<sup>7</sup> We are mainly interested in the characterization and explanation of the reproductive outcomes of the foreign wives from the five most important source countries. Our research is based on the micro data of Taiwan's 2003 Census of Foreign Spouses, which has a very large number of individual records and rather rich information on potentially relevant causal factors.<sup>8</sup> Our main scientific contribution lies in demonstrating the use of a scientifically sound methodology to extract substantively meaningful information from a large cross-sectional micro data set.

The organization of the remaining part of the paper is as follows. The nature of the data and the measurement of fertility are described in section 2. The observed fertility patterns are presented in section 3. In section 4, we formulate a multivariate model to explain the fertility outcomes, describe the statistical method, and introduce the explanatory factors to be included in the model. Our multivariate findings are presented in section 5. In section 6, the empirical findings are contextualized. The main points and policy suggestions are presented in section 7.

## **2. Data and measurement**

In light of the rapidly increasing number of foreign spouses and the lack of comprehensive and in-depth information about their living conditions, concerns, and needs for assistance, the Ministry of Interior (MOI) conducted an unprecedented census of the foreign spouses of Taiwanese citizens in 2003.<sup>9</sup> The universe of the census was created by merging (1) the records of foreign spouses (not including those from China) in the data system of the National Police Agency, (2) the records of spouses from China in the data system of the National Immigration Agency, and (3) the records of naturalized foreign spouses belonging to the Department of Household Registration in MOI. These

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<sup>7</sup> From 1998 to 2009, Taiwan's foreign wives gave birth to 278,907 infants, contributing to 9.9% of all births (MOI 2009).

<sup>8</sup> The official name of this census is "Survey of the Living Conditions of Foreign and Chinese-Mainland Spouses." Since it attempted to cover all resident non Taiwanese spouses of Taiwanese people, it was actually a "census."

<sup>9</sup> Our description of the 2003 census of foreign spouses is based on the documents shown on the website: [http://www.ris.gov.tw/version96/stpeqr\\_02\\_01.html](http://www.ris.gov.tw/version96/stpeqr_02_01.html), which is maintained by the Department of Household Registration, MOI (accessed on January 4, 2011).

records were further cross-checked with the household records of the Taiwanese who had married a foreign spouse in the Information System of Household Registration, MOI.

The universe of this census included 240,837 residents who were spouses of Taiwanese citizens and did not have Taiwanese citizenship at the time of marriage. Among them, 224,196 were foreign wives of Taiwanese men and 16,641 were foreign husbands of Taiwanese women. With the coverage rates of 74.7% for the foreign wives and 50.5% for the foreign husbands, the 2003 census yielded a total of 175,909 individual records, including 167,505 foreign wives and 8,404 foreign husbands. It is worth noting that in order to avoid the high cost of conducting another census of foreign spouses, the MOI used a survey to collect more recent micro data on the foreign wives in 2008. Since the 2008 survey has a much smaller sample size (13,047) and does not permit the distinction of Southeast Asian wives by specific nationality, the 2003 census data remain the best micro data for obtaining highly reliable findings on the foreign wives of specific nationalities in Taiwan.<sup>10</sup>

Among the foreign wives, the top five specific reasons for under-coverage were (1) disappeared (25.1%)<sup>11</sup>, (2) moved to another place (migration, 18.5%), (3) failed to meet after repeated visits (16.4%), (4) unoccupied dwelling or incorrect address (11.7%), and (5) divorced (6.3%) (Su et al. 2006:15). Similar to the population censuses of all countries, the extents of under-coverage were biased with respect to certain personal attributes.<sup>12</sup> According to the analysis of Su et al. (2006), the under-coverage problem was more serious for foreign spouses from China than for those from Southeast Asian countries, whereas the under-coverage was not biased with respect to educational attainment. So far no attempt has been made to create a weight variable to adjust for the biases in under-coverage. The implications of the under-coverage biases on the interpretations of our findings will be discussed later.

In selecting the sample of foreign wives for our in-depth analysis, we impose three restrictions. The first restriction is that the year of marriage be between 1980 and 2003. Our lack of interest in the pre-1980 marriages is related to the fact that Taiwan's fertility regime was going through a very rapid transition in the 1960s and 1970s (Yang and Tsai

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<sup>10</sup> There are various limitations in using the micro data of the 2000 population census of Taiwan to study the reproductive contributions of foreign wives. For example, the population census does not have information on the number of children ever born, although the number of children in the household might be used as a rough proxy. Although many foreigners can be identified by the information on citizenship, the foreign wives who have been naturalized cannot be properly identified. Despite such limitations, we are exploring the possibility of using the micro data of the population census to conduct research on Taiwan's foreign wives.

<sup>11</sup> The foreign spouses who had disappeared were those who were known to have left an occupied dwelling and whose information after the departure was completely unknown to census workers.

<sup>12</sup> Take the 2001 population census of Canada for example. The net under-coverage rate differed substantially with respect to age: 7.19% for the 20-24 age group versus 0.84% for the 55-64 age group (Statistics Canada, undated: 65). In light of such a serious bias, Statistics Canada has not used census data as the denominators for computing age-specific birth and death rates. Instead, the denominators were based on a series of population estimates.

2007), and the fact that only a very small proportion of the foreign wives got married before 1980. Among the 167,505 foreign wives in the original data set, as many as 163,998 (or 97.91%) got married in 1980-2003, whereas only 3,507 (or 2.09%) did so before 1980.

Our second restriction is that the marriage age be between 15 and 44 years. Since it was very unlikely that the marriage ages in the period since 1980 could have been less than 15 years, we assume that the 0-14 age interval contained a high proportion of the records with misreported or miscoded marriage ages and hence should be excluded from our analysis. The exclusion of the records in the 45+ age interval from our analysis was due to the fact that extremely few births occurred to those in this age interval. This restriction had a rather small effect on the reduction of the sample size. Only 1.53% and 3.78% of those married in 1980-2003 were younger than 15 years and older than 44 years at marriage, respectively. With this restriction, the sample size became 155,283 persons.

Our last restriction is that the foreign wives be from the top five countries of origin: China, Vietnam, Indonesia, the Philippines, and Thailand. Since these five nationalities represented as much as 95.8% of the sample, this restriction resulted in very little loss of information. There are two main reasons for paying attention to the countries of origin. First, in a preliminary analysis, we found that the effect of marriage age on fertility differed substantially among the original nationalities of the foreign wives. Second, the assimilation of the second generation is expected to differ systematically by source countries, especially between those originating from China on the one hand and those originating from Southeast Asian countries on the other. As a consequence of this additional restriction, the sample size became 148,688. In our multivariate analysis, the sample size is further reduced to 147,707, because there were 981 foreign wives whose husband's age was missing so that their spousal age gap, which was one of the more important explanatory factors, could not be computed.

It is important to mention that the 2003 census did not collect information on the numbers of children that were not conceived with Taiwanese husbands. Thus, any attempt to assess the fertility outcomes of the foreign wives from this data source will understate the fertility levels of these women to some extent. However, since Taiwanese men and their families mostly do not allow their foreign wives to bring their previous children to Taiwan, the deliberate exclusion of the previous children by the design of the questionnaire can be expected to have little effect on the assessments of the reproductive contributions of the foreign wives to the population of Taiwan.

It is also important to mention that for each foreign wife, the reproductive information used in our study is *the number of children ever born (with her Taiwanese husband) up to the time of the 2003 census*. In other words, we do not use the information on the birth (or the lack of it) in any specific calendar year, which is not directly available in the data. Thus, for any group of foreign wives, we define their *fertility rate* as (1) the number of children ever born to them, divided by (2) the number of women in the group. Borrowing terminology from epidemiology, the fertility rate conceptualized and



computed in our analysis is a "prevalence rate" rather than an "incidence rate" (Mausner and Kramer 1985:44-54). Since the distinction between these two types of rates is very important to avoiding unnecessary confusion, we will digress to discuss them.

An incidence rate has a numerator that is the number of events (or incidences) that have happened to (or been produced by) a well defined at-risk population over a short period of time. In most areas of demography, the period of time is one year. The denominator of an incidence rate is a product of (1) the size of the at-risk population and (2) the time interval used to observe the events. Since the time interval is usually one year, its existence in the denominator may be easily forgotten or ignored. Since incidence rate is at the core of sophisticated models in event history analysis, some demographers, especially those with great analytical skills, may assert that it is the only scientifically valid definition of a rate.

A prevalence rate has a numerator that is the number of events (or incidences) that have happened to (or been produced by) a well defined at-risk population over a long, varying, or uncertain period of time. The numerator could be the number of children ever born or the number of people with lung cancer at a point in time. The denominator of a prevalence rate is simply the size of the at-risk population. Thus, the unit of a prevalence rate is inherently different from that of an incidence rate. This difference may seem trivial until one sees in the literature that the 2003 census data set was used to compute the total fertility rate (*TFR*) of Taiwan's foreign wives, which turned out to be ridiculously high (Chen, 2008). To avoid confusion, we urge the readers to keep in mind that the fertility rates used in our data analysis are fundamentally different from the age-specific fertility rates (i.e., incidence rates) used in the computation of *TFR*.

### 3. Observed patterns

The overall fertility rate of foreign wives turned out to be 0.90 children per woman. By restricting both the numerator and the denominator to those of each of the five nationalities in question, we found that the overall fertility rate varied substantially among the five major source countries, ranging from 0.77 children for those from China to 1.44 children for those from the Philippines. These values were inappropriate indicators for reflecting the potential reproductive contributions of different nationality groups, because they were seriously affected by the large difference in average marriage duration—only 3.85 years for those from China but as high as 6.51 years for those from the Philippines.

A better fertility measure is the *lifetime fertility rate (LTFR)*, which is defined as the average number of children ever born to the foreign wives whose marriage durations were ten or more years. Since practically all reproduction of foreign wives took place within ten years since marriage, *LTFR could be taken as a measure of the total*

*reproductive contribution of the foreign wives through all their reproductive years to the population of Taiwan, on a per capita basis.* It turned out that the *LTFR* of all five nationality groups combined was 1.58 children. The fact that this value was substantially lower than 2 implied that the reproductive contribution of the foreign wives cannot be expected to help prevent the long-term shrinkage of the base of Taiwan's population pyramid and the long-term decline of Taiwan's total population.

How did the overall fertility level of the foreign wives compare with that of all women in Taiwan? To answer this question, we used the micro data of Taiwan's 2003 Survey of Women on Marriage, Fertility, and Employment that was conducted by Taiwan's Census Bureau. The universe of this survey covered all female residents of all households in Taiwan who were aged 15 years or over. Representing about 0.33% of the universe, the micro data set from the survey included 29,712 individuals, with unequal weights. In order to maintain a close match to the foreign wives selected for this study, we selected a sample by imposing the conditions (1) that the year of first marriage be later than 1979, (2) that the age at first marriage be 15-44 years, and (3) that the duration of marriage be at least 10 years. The size of the resulting sample remained quite large ( $N=6,206$ ). Using the weighted observations of this sample, we found that the *LTFR* of the ever-married women in Taiwan was 2.29. Thus, we could infer that the overall fertility level of the foreign wives was substantially lower than that of their Taiwanese counterparts.

It is worth noting that the *LTFR* of 2.29 did not imply that the fertility level of the population of Taiwan was above the replacement level, because many Taiwanese women remained single, and because unmarried childbirths were socially stigmatized and were very rare in Taiwan. For reference, the tempo-adjusted TFRs (Bongaarts and Feeney 1998; Bongaarts 2008) of Taiwan between 2001 and 2005 were found by Wang and Liu (2008:48) to be at the level of 1.50 children - a level that was clearly below replacement.

With a *LTFR* of only 1.40 children, the wives from China were distinguished as having the lowest fertility level among those from the top five source countries. The *LTFRs* for the foreign wives from the other source countries were: 1.64 children for the Vietnamese, 1.67 children for the Thais, 1.85 children for the Filipinas, and 2.03 children for the Indonesians. Compared with the *LTFR* of all women in Taiwan (2.29 children), we found that the reproductive contribution of the foreign wives from each of these five source countries were less than that of their Taiwanese counterparts.

The usefulness of *LTFR* as a general measure of the fertility levels of the foreign wives might be largely undermined by the fact that the cross-sectional data of the census did not allow the distinction between the effect of marriage year (i.e., the time of marriage) and the effect of marriage duration. Without this distinction, the representativeness of *LTFR* would be in doubt if the reproductive behaviors of different marriage cohorts (i.e., cohorts that got married in different periods) differed sharply. In Figure 1, we see that the fertility rate of each of the five nationality groups tended to increase with marriage duration in a relatively smooth and nearly monotonic way, and

that the increase tended to taper off. This finding suggests that the effect of marriage duration was much more important than the effect of marriage cohort. In other words, it is reasonable to assume that different marriage cohorts shared highly similar reproductive behaviors. Thus, for the foreign wives under consideration, *LTFR* could be considered as a representative measure of the lifetime reproductive contribution of the foreign wives from each of the five source countries.

**Figure 1: Observed fertility rates of Taiwan foreign wives from the top five source countries by marriage duration**

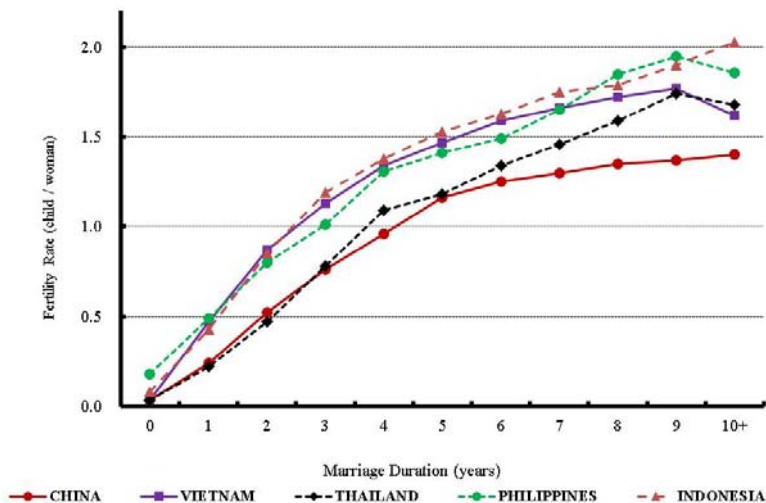


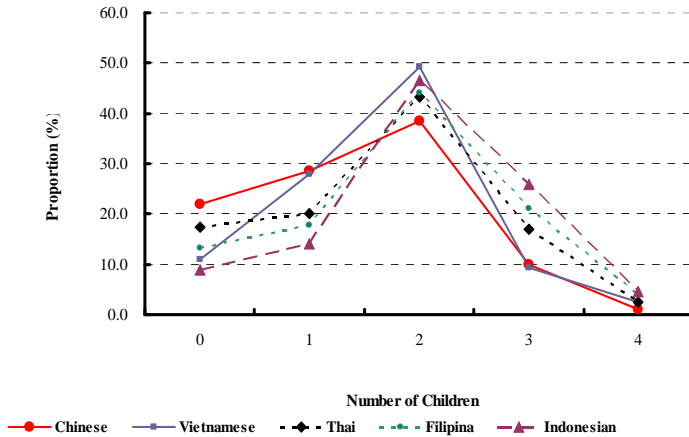
Figure 1 shows that for every nationality group, the fertility rate increased rapidly in the first few years so that more than half of *LTFR* was accomplished by the 4th year of marriage. Behind this rapid increase in fertility rate was the fact that for the five top source countries combined, the childless proportion decreased extremely rapidly from 96.7% in year 0, to 66.1% in year 1, and 38.7% in year 2. For the Vietnamese wives, the decline in the childless proportion in the first two years was particularly sharp: from 97.4% in year 0, to 53.9% in year 1, and 21.7% in year 2. This very sharp decline did not fit well with the statement that “Taiwanese male spouses want their heirs to be born as soon as possible, while Vietnamese female spouses try to delay childbirth by contraception and to work as long as possible, thereby making more remittances to their home country” (Kojima 2007:181). Beyond the 7th year, the fertility curves approached a plateau. The minor decline at the end of the curves for those from the Philippines and Thailand probably reflected cohort effects, whereas the similar decline for those from

Vietnam was probably untrustworthy due to the very small number (only 154 individuals) of Vietnamese wives with a marriage duration of 10 or more years.

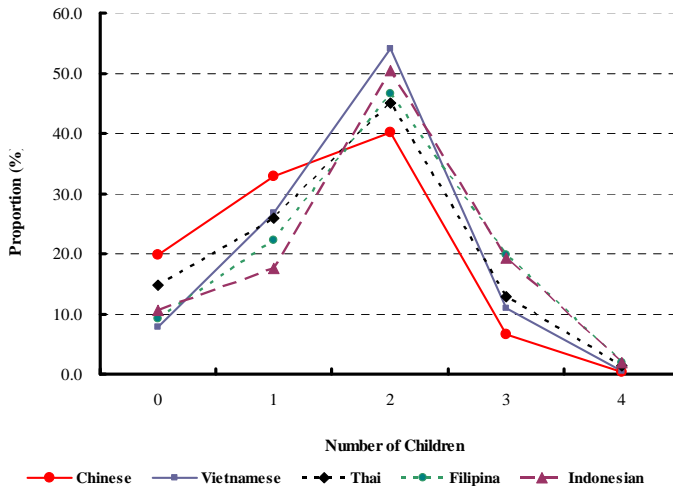
In addition to *LTFR*, it is useful to compare the distributions of the foreign wives across the number of childbirths among the five nationality groups. These distributions are shown for the marriage duration of 10+ years in Figure 2a, and for the marriage duration of 7 to 9 years in Figure 2b. Since the curve in Figure 2a for those from Vietnam might not be reliable due to the smallness of the sample size, we also created the curves in Figure 2b. Both Figures 2a and 2b indicate that those from Vietnam were most capable of achieving the ideal family size of two children (about 50%), with a relatively low proportion being childless (about 10%) as well as a relatively low proportion having three children (also about 10%). Based on Figure 2a, we make the following comparisons. Compared with the wives from the Southeast Asian countries, those from China were distinguished by having the highest proportion remaining childless (22%) and the lowest proportion achieving the ideal family size of two children (38%). The proportion having three children was the highest for those from Indonesia (26%) and the Philippines (21%). Although those from Indonesia and the Philippines were also more prone to having four or more children than their counterparts from the other three countries, the proportion attaining such a high fertility was very low for all five source countries (less than 5%).

The reproductive outcomes of the foreign wives from each source country depended not only on marriage duration but also on other factors like marriage age, spousal age gap, employment status, and living arrangement. Since such factors differed substantially among the source countries and could be changed by the husbands, the wives themselves and their families, as well as by marriage brokers and government interventions, it is useful to assess the effects of such factors on the reproductive outcomes of the foreign wives. Since it is very likely that the explanatory powers of some of the factors overlap with each other, it is essential to carry out this assessment in a multivariate framework. The possibility that failure to control for the effects of other factors in assessing the effect of a given factor could lead to a very misleading inference can be demonstrated by the following example. We found that among the Chinese wives in our selected sample, those whose marriage with their Taiwanese husband was their second marriage had a *LTFR* of only 0.32 children. To a large extent, this very low *LTFR* was due to (1) the fact that this subgroup of women had a very high mean marriage age (35.2 years) and a very large average spousal age gap (20.1 years), and (2) the fact that both marriage age and spousal age gap also had negative effects on fertility rate. In other words, without controlling for the effects of marriage age and spousal age gap in a multivariate model, the effect of being the second marriage would be seriously overstated.

**Figure 2a:** Observed distributions of Taiwan's foreign wives with respect to the numbers of children ever born with their Taiwanese husbands: for marriage duration = 10+ years



**Figure 2b:** Observed distributions of Taiwan's foreign wives with respect to the numbers of children ever born with their Taiwanese husbands: for marriage duration = 7-9 years



#### 4. Formulation of the multivariate model and specification of explanatory variables

We choose to use a multinomial logit model to investigate how various personal attributes affected the reproductive outcomes of the foreign wives. This model has the following advantages over a multiple regression model. First, it completely avoids the possibility of generating negative predicted fertility rates that do not make any substantive sense. At an early stage of our investigation, we tried a multiple regression model and found that the predicted fertility rates for some groups of foreign wives turned out to be negative. Second, in addition to being able to generate substantively sensible predicted fertility rates, the multinomial logit model can explicitly deal with the distribution of wives among the number of children they managed to produce. This distribution is a substantively important aspect of the reproductive outcomes. For example, if an increase in the average marriage age of wives resulted in a decrease in fertility rate, it is useful to know whether the decrease involved a sharp increase in the probability of being childless or in the probability of having only one child. The former outcome would be a much more serious threat to the continuation of the family line than the latter. Third, since some personal factor such as husband's employment status may enhance the ability of achieving the ideal family size of two children rather than increasing or decreasing the fertility rate,<sup>13</sup> a multinomial logit model can effectively deal with this kind of possibility, whereas a multiple regression model can not. Neither can a Poisson regression model, a negative binomial regression model, nor an order logit model. A price to be paid for these advantages of using a multinomial logit model is that the programming task requires more effort, and that the computing time becomes much longer.

Since very few of the foreign wives gave birth to more than 4 children, we assume that there were only 5 alternatives in the choice set, namely {0, 1, 2, 3, 4}. Strictly speaking, the last alternative {4} represented "4 or more children." But, for practical purposes, it basically represented "4 children." Using the alternative of giving birth to 2 children as the reference alternative, we use a multinomial logit model of the following form:

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<sup>13</sup> In light of the entrenchment of sub-replacement fertility level since the mid-1980s, the government of Taiwan has been promoting the two-child family as an ideal model: "Two Children is Exactly Right" (Tsay 2003). It is interesting to note that the historical fertility decline of Japan towards the replacement level was accompanied by a *reduction* in the proportion of women being childless (Ochiai 1994). In other words, it was a transition towards the two-child ideal family model.

$$\ln \left( \frac{P_{ij}}{P_{i2}} \right) = \sum_{\substack{k=0 \\ k \neq 2}}^4 \left[ \beta_{0k} D_{ij} + \sum_{m=1}^M \beta_{mk} X_{im} D_{jk} \right] \quad (1)$$

where  $P_{ij}$  is the probability that person  $i$  gives birth to  $j$  children (for  $j = 0, 1, 3, 4$ );  $P_{i2}$  is the probability that person  $i$  gives birth to 2 children;  $\ln(\cdot)$  is natural log function;  $D_{jk}$  is an alternative-specific dummy variable such that it assumes the value of 1 if subscript  $j$  is equal to subscript  $k$ ;  $X_{im}$  is the  $m$ -th explanatory variable representing an observable attribute of person  $i$ ;  $\beta_{0k}$  and  $\beta_{mk}$  are unknown coefficients to be estimated; and  $M$  is the number of explanatory variables. Note that all explanatory variables representing personal attributes enter into the model as interactions with the alternative-specific dummy variables in the form of  $X_{im}D_{jk}$ .

The unknown coefficients are estimated by maximizing the following likelihood function:

$$\prod_{i=1}^n \prod_{j=0}^4 P_{ij}^{Y_{ij}} \quad (2)$$

where  $Y_{ij}$  is a dummy variable such that it assumes the value of 1 if the data show that person  $i$  has given birth to  $j$  child(ren); and  $n$  is the number of foreign wives. The iterative computation of the estimated coefficients is based on the Newton-Raphson algorithm with an adjustable step size (Bonnans et al. 2003; Fletcher 1987). The estimation is done by a module that was written by the first author and Zhongdong Ma and runs under the *IML* procedure of *SAS*. This module has two nice features that the commonly-used *CATMOD* procedure of *SAS* lacks. First, when the iterative algorithm fails to lead to convergence, it has the flexibility of allowing the user to reduce the step size so that convergence can be achieved.<sup>14</sup> Second, unlike *CATMOD* which automatically generates the estimated coefficients for the interactions of any explanatory variable with the full set of alternative-specific dummy variables ( $D_{j0}$ ,  $D_{j1}$ ,  $D_{j3}$ , and  $D_{j4}$ ) in the model, this module has the flexibility of allowing the user to suppress the interactions with some alternative-specific dummy variables whose estimated coefficients turn out to be not

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<sup>14</sup> The use of adjustable step size is an extremely convenient feature. We have found that by letting the step size be a number greater than 0 and less than or equal to 1, we could conveniently start with 0 for all the parameters to be estimated and avoid the problem of divergence. Of course, the smaller the step size, the slower the convergence. In our own work, we usually use a step size of 0.8. In the most difficult cases, convergence occurred after we let the step size be 0.07.

significantly different from zero.<sup>15</sup> Experienced users of the *IML* procedure are welcome to ask for a free copy of this module from the first author.

The goodness of fit for a given specification of the model is measured by:

$$\rho^2 = 1 - L_g / L_o, \tag{3}$$

where  $L_g$  is the log likelihood of the given specification of the model, and  $L_o$  is the log likelihood of the null model (i.e., the model with all coefficients of the interactions  $X_{im}D_{jk}$  set to zero).<sup>16</sup> The upper bound of  $\rho^2$  is usually substantially less than 1.0 so that a value of 0.2 may indicate a very good fit (McFadden 1974).

For a group of foreign wives who share the same set of values of all explanatory variables with person  $i$ , we define their predicted fertility rate  $F_i$  as:

$$F_i = \sum_{j=0}^4 jP'_{ij} \tag{4}$$

where  $P'_{ij}$  is the estimated value of  $P_{ij}$  that is computed from the estimated coefficients.

As suggested by Figure 1, it is important that the model contains the personal attribute of **marriage duration** as an explanatory factor. To avoid unintended systematic bias that may arise by using a specific functional form (e.g., a quadratic form), we make the sensible decision of using as many as ten dummy variables to control for the effect of marriage duration on the probabilities of the reproductive alternatives (and ultimately on the fertility rate). Using zero year (i.e., less than one year) as the reference category for marriage duration, these ten dummy variables represent 1, 2, 3, ...9, 10+ years, respectively. Note that in the case with the marriage duration being 10+ years, the  $F_i$  defined in equation (4) becomes the *predicted LFR*.

Based on the literature and our own understanding of reproductive behaviors, the following additional personal attributes are considered to be potentially useful explanatory factors. Since the intensity of reproduction tends to decrease sharply from the early 30s for both physiological and socioeconomic reasons (Rizzi and Rosina 2006), we choose **age at marriage** as another key personal attribute to be included in our model. Using the 19-24 age group as the reference category, this explanatory factor is

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<sup>15</sup> An additional nice feature of this module is that it allows the user to introduce the attributes of the alternatives in the choice set to be part of the explanatory variables. Thus, it allows the user to test a hypothesis like "better educated migrants are less subject to distance decay effect than less educated migrants." By design, *CATMOD* does not have this capacity.

<sup>16</sup> Since our sample sizes are very large, the difference between  $\rho^2$  and adjusted  $\rho^2$  is negligible. For convenience, we use  $\rho^2$  as the measure of goodness of fit.



represented by the dummy variables for the 15-18, 25-29, 30-35, and 36-44 age groups, respectively.

For socioeconomic and perhaps physiological reasons, a very large age gap between husband and wife is bound to have a negative effect on reproductive outcome. Thus, we also select *spousal age gap* (husband's age minus wife's age) as an explanatory factor. Using less than 10 years as the reference category, this explanatory factor is represented by the dummy variables for the 10-14, 15-19, and 20+ age gaps, respectively.

Since disruptions in marriages are also likely to have negative effects on reproductive outcomes, we also select *marital status* as an explanatory factor. Using the married status as the reference category, this explanatory factor is represented by the dummy variables for the separated, divorced, and widowed statuses, respectively.

Whether the current marriage with the Taiwanese husband is the second marriage of the wife can also affect the foreign wife's willingness and ability to reproduce. If a previously married woman had given birth to a child in her home country, she might have a strong emotional attachment and financial commitment to her child and kin in her native land, so that she might plan to return to live in her native land after the death of, or the divorce from, her Taiwanese husband. For such a woman, it is quite rational to have no child or at most one child with the Taiwanese husband. If such a woman was from China, she might have been sterilized under the one-child policy so that she could only serve as a "companion" of her Taiwanese husband without the possibility of yielding any children. Thus, we also choose *remarriage status* as an explanatory factor. This explanatory factor is represented by a dummy variable assuming the value of 1 if the current marriage is the second marriage.

Recent literature on the extremely low fertilities of southern and eastern European and advanced Asian countries has highlighted the serious difficulty of married women in carrying the double burden of household and occupational work (e.g., Ochiai 1994; McDonald 2000a, 2000b; Jones 2007). Co-residence with the husband's parents may help alleviate this difficulty and hence increase the willingness to reproduce. Furthermore, such co-resident families may assign a high value to the continuation of the family line and hence encourage the birth of at least one child, especially a son. The co-resident arrangement can also facilitate the applications of sanctions by parents to enforce their preference (Weinstein et al. 1990). Therefore, we also choose *living arrangement* as an explanatory factor. This explanatory factor is represented by a dummy variable assuming the value of 1 if the person in question lived with parent.

A large body of theoretical and empirical work on fertility transition has highlighted and demonstrated the negative effect of wife's educational attainment on fertility level (Becker 1981; Ryder and Westoff 1971; Freedmen et al. 1963; Hermalin 1974; Chang, Freedman and Sun 1987; Chang and Lee 2001; Sun 2001). Some empirical studies also indicated that husband's educational attainment also had a negative effect on fertility in the early stage of Taiwan's fertility transition (Mueller 1972; Chang and Tsao 1981). It would be interesting to see if educational attainment remained an influential fertility

determinant for the foreign wives after the transition to replacement fertility was completed. Therefore, we also choose the *educational attainments of both wife and husband* as additional explanatory factors. For each of these two explanatory factors, we use less than high school education as the reference category and use two dummy variables to represent (1) high school graduation and (2) college or higher degree, respectively.

A distinctive demographic phenomenon of Taiwan was an overabundance of spouseless veterans, which resulted from a large influx of young soldiers from Mainland China in the late 1940s who were ordered to remain unmarried by the national government in the 1950s (Chen 2008; Huang 2006). Among the older veterans with modest economic status, the continuation of the family line was probably not an important reason for getting a foreign wife. To them, a foreign wife was expected to satisfy their sexual needs and to be their care providers. Therefore, we also select *husband's veteran status* as an explanatory factor. This explanatory factor is represented by a dummy variable assuming the value of 1 if the person in question was married to a veteran.

In light of the unwillingness of many Taiwanese husbands to share household chores with their wives, it is likely that the foreign wives who held "fixed jobs" (i.e., not temporary jobs) were less willing to reproduce. In contrast, the husbands who held fixed jobs might have a stronger confidence in his family's future prospect. This confidence might enable them to achieve the ideal two-child family. Thus, we also choose the *employment statuses of both wife and husband* as additional explanatory factors. We expect these two factors to have rather different effects on reproductive outcomes. Each of these two explanatory factors is represented by a dummy variable assuming the value of 1 if the person in question held a fixed job.

About 10% of Taiwan's foreign wives are married to disabled men who had difficulty in finding willing Taiwanese wives. To the extent that disabled men on average lived shorter lives and had less income security, there might be incentives for their foreign wives to restrict their fertility. Thus, we also choose *husband's health status* as an explanatory factor. This explanatory factor is represented by a dummy variable assuming the value of 1 if the husband had disability.

Finally for various contextual reasons, the fertility level in Taiwan has been lower in highly urbanized regions than in the rest of the country since at least the late 1950s (Freedmen et al. 1963; Hermalin 1974). Expecting that the reproductive behaviors of the foreign wives were also subject to such contextual influences, we also select the *place of residence* as an explanatory factor. We use the geo-codes at the administrative level of large cities and prefectures to define two categories of residence: metropolitan areas and non metropolitan areas. The former includes all large cities as well as Taipei Prefecture, which is mostly the suburban area surrounding Taipei City, whereas the latter includes the remaining areas of Taiwan. This explanatory factor is then represented by a dummy variable assuming the value of 1 if the person in question resided in a metropolitan area.

A few salient features of the five nationality groups can be seen from the summary statistics of our chosen explanatory factors (Table 1).

**Table 1: Summary statistics of the personal attributes that have systematic effects on the reproductive contributions of the foreign wives of Taiwanese husbands**

Explanatory Factor	Source country of Taiwan's Foreign Wives					
	China	Vietnam	Indonesia	Thailand	Philippines	All Five
1. Marriage duration: Mean (year)	3.85	2.64	5.15	5.38	6.51	3.73
2. Age at Marriage						
Mean (year):	27.51	21.84	23.59	27.77	26.3	25.3
Distribution (%):						
15-18 years	0.3	14	17.1	2.2	1.7	6.5
19-24 years	38.7	67.2	49.6	29.7	37.2	48.4
25-29 years	31.1	13.7	17.7	34.1	38	24.4
30-35 years	16.8	4	10	23.2	17.9	12.3
36-44 years	13.1	1.1	5.6	10.8	5.2	8.3
3. Spousal Age Gap						
Mean (year):	12.2	14	11.1	7.2	7.1	12.4
Distribution (%):						
< 10 years	47.5	23.8	40	66.3	65.3	40.2
10-14 years	23.7	32	31.6	17.2	19.1	26.9
15-19 years	11.5	27.3	20.3	9.2	10.1	17.3
20 or more years	17.3	17	8.1	7.3	5.6	15.6
4. Marital Status (%)						
Separated	2.3	0.5	0.8	1	0.9	1.5
Divorced	2	0.8	0.8	0.9	0.8	1.4
Widowed	1	0.4	0.9	1.4	1.4	0.8
Married	94.7	98.3	97.5	96.7	96.9	96.2
5. Wife's Remarriage Status (%)						
Second Marriage	15.4	1	2.5	10	1.5	9.1
6. Living Arrangement (%)						
With parent	39.7	59.4	55.8	41.6	45.5	47.8
7. Wife's Educational Attainment (%)						
< High School	60.8	77	70.6	66.2	33	66.4
High School	28.5	19.4	24.3	22.6	27.8	25.1
College or higher	10.7	3.6	5.1	11.2	39.3	8.5
8. Husband's Educational Attainment (%)						
< High School	46.2	55.6	61.5	49.1	45.7	50.9
High School	38.3	37.5	33.9	36.4	30.9	37.3
College or University or higher	15.5	6.9	4.6	14.6	23.5	11.8
9. Husband's Veteran Status (%)						
Veteran	12.4	1.7	1.9	5	2.4	7.5
10. Wife's Employment Status (%)						
Fixed Job	14.4	16.4	22.1	33.1	30.6	16.7
11. Husband's Employment Status (%)						
Fixed Job	69.3	81.2	78.5	80.2	79	74.5
12. Husband's Health Status (%)						
Disabled	9	9.7	10.5	6.6	9.3	9.4
13. Place of Residence (%)						
Metropolitan area	46.8	34.6	22.4	37	34.2	39.7
Sample size (person)	78777	44879	17377	3181	3493	147707

Note: The percentages are computed across the categories of each personal attribute.  
For a personal attribute with only two categories, one of the categories is not shown in the table.

- Vietnamese and Indonesian wives tended to get married at much younger ages than their Chinese, Thai, and Filipina counterparts. The mean age at marriage was 21.8 for those from Vietnam and 23.6 for those from Indonesia, compared with 27.5 for those from China, 27.8 for those from Thailand, and 26.3 for those from the Philippines. Beneath this large difference in mean age at marriage was the fact that the proportion getting married at the very young ages of 15-18 was 14.0% for those from Vietnam and 17.1% for those from Indonesia, compared with less than 3% for those from each of the three remaining countries. The very young Vietnamese wives were mainly daughters of desperately poor parents who married them off to Taiwanese men as soon as possible to overcome economic hardship via initial bride price and subsequent remittances (Nguyen and Tran 2010). The low mean marriage age of Indonesian wives was related to the fact that the family systems of Indonesia were characterized by early age at marriage that had not been lengthened very much by the influence of modernization (Jones 2001). Based on the data of the 1997 Indonesian Family Life Survey, Buttenheim and Nobles (2009) found that the average age at first marriage for females was only 18.2 years.
- The foreign wives from all five major source countries had very large and very different average spousal age gaps, ranging from 7.1 and 7.2 years for those from the Philippines and Thailand to 12.2 and 14.0 years for those from China and Vietnam. These values were greater than the corresponding values of all first marriages (2.7 years) and all remarriages (6.1 years) that took place in Taiwan in 2008 (MOI 2009).
- Second marriage involved much higher proportions of Chinese and Thai wives (15.4% and 10.0%) than Vietnamese, Indonesian, and Filipina wives (1.0%, 2.5%, and 1.5%).
- While the propensity to co-reside with the husband's parent(s) was quite high for all five foreign nationalities, Vietnamese and Indonesian wives were much more prone to co-residing with parents than were their Chinese, Thai, and Filipina counterparts. The co-residing proportion was 59.4% for Vietnamese wives and 55.8% for Indonesian wives, compared with 39.7%, 41.6%, and 45.7% for their Chinese, Thai, and Filipina counterparts, respectively. For reference Lin (2009) found from Taiwan's 2002 "National Survey on Knowledge, Attitude and Practice of Health Promotion" that 38% of currently married women in the 20-44 age group in Taiwan co-resided with their husbands' parents or their own parents.
- Filipina wives were by far the best educated and did not fit into the poorly educated stereotype of foreign wives in Taiwan, whereas Vietnamese and Indonesian wives were mostly poorly educated. The proportion of the foreign wives with at least a college degree was as high as 39.3% for the Filipinas,

compared with only 3.6% for the Vietnamese and 5.1% for the Indonesians. For reference Lin (2009) showed that 29% of Taiwan's currently married women in the 20-44 age group in 2002 had more than 12 years of education.

- Among the five source countries, husband's educational attainment was positively correlated with wife's educational attainment.
- Chinese wives were more prone to marrying veterans (12.4%) than were those of the other nationalities: 5.0% for the Thais, 2.4% for the Filipinas, and less than 2% for the Vietnamese and Indonesians.
- Thai and Filipina wives were much more likely to hold fixed jobs (33.1% and 30.6%) than were Chinese and Vietnamese wives (14.4% and 16.4%), while Indonesian wives were between these two extremes (22.1%). The very low proportion of Chinese wives holding fixed jobs was related to the fact that the government of Taiwan, being concerned with the negative impacts of a potentially large influx of labor across the Strait of Taiwan on the employment opportunities of low-skilled Taiwanese labor and probably on Taiwan's political independence from China, made it more difficult for Chinese wives to obtain a work permit, forcing many of them to work illegally in menial low-paying jobs (Tsao 2005).

## 5. Multivariate findings

We applied the multinomial logit model to each of the five nationality groups separately. In the model for the Vietnamese wives, we made the adjustment of merging the highest five categories of marriage duration (6, 7, 8, 9, and 10+) into one category (6+ years). The adjustment was due to the smallness of sample sizes in the highest four categories, which was in turn due to the very recent arrivals of the Vietnamese into Taiwan's marriage market. The *predicted LTFR* for the Vietnamese wives was also adjusted to be the  $F_i$  for the case with the marriage duration being 6+ years.

In general, the explanatory variables with a t-ratio of less than 2.0 in magnitude were removed from the model, because the null hypothesis that in the context of other explanatory variables, the explanatory variables in question have no effect on the dependent variable, cannot be formally rejected. However, when a set of estimated coefficients associated with a substantive variable (e.g., the dummy variable representing husband's high school educational attainment) showed a substantively sensible pattern, we chose to keep the whole set of the corresponding interactions in the model, even though one or two of the estimated coefficients in the set were associated with a t-ratio of less than 2.0 in magnitude.

Overall the nationality-specific models fitted the data quite well: the values of  $\rho^2$  ranged between 0.1523 for the Filipina wives and 0.3077 for the Chinese wives. In

reporting the specific findings of our multivariate analysis, we will focus on (1) the dependence of the *predicted fertility rate* on marriage duration and (2) the effects of other explanatory factors on the *predicted LTFR* and on the predicted Probability of Lifetime Childlessness (i.e.,  $P'_{i0}$  for individuals with the highest marriage duration). Lifetime childlessness should be of particular concern, because it could worsen the likelihood of marriage breakup (Kim 2010) and weaken foreign wives' long-term commitment and sense of belonging to the host society. The estimated coefficients are all shown in our working paper (Liaw, Lin, and Liu 2009).

### 5.1. The effects of marriage duration on the predicted fertility rate

In the model for each of the five nationality groups of the foreign wives, we computed the predicted fertility rate for each category of marriage duration, while constraining the values of all the dummy variables representing other explanatory factors ( $X_{im}$ ) to zero. The result is shown in Figure 3 and reveals the following main features.

First, similar to the pattern of the observed rates shown in Figure 1, we find that for each of the nationality groups, the predicted fertility rate increased sharply from 0 to 4 years and approached a plateau beyond 7 years. Second, the curves turned out to be amazingly smooth, despite the fact that we have not imposed any smooth mathematical function to represent the effect of marriage duration. These two features provide strong support for the assertion that marriage duration is much more important than marriage cohort in determining the reproductive outcome.

Third, the fertility rate started at a higher level for the Filipina wives than for those of the other nationalities. This feature suggests that the Filipina wives were more prone to entering Taiwan as foreign workers and to having sexual relationships with their Taiwanese husband before the marriage was formally arranged.

Fourth, for marriage duration of three or more years, the predicted fertility rates showed a clear three-way contrast: (1) a relatively high level for the wives from Indonesia and the Philippines, (2) an intermediate level for the wives from Vietnam, and (3) a relatively low level for the wives from Thailand and China. This contrast corresponded to a large extent to the relative fertility levels in the source countries. We found in the 2003 World Population Data Sheet of the PRB that among these five source countries, the *TFRs* were the highest in the Philippines (3.5) and Indonesia (2.6), and the lowest in Thailand (1.7) and China (1.7), while being intermediate in Vietnam (2.3).<sup>17</sup>

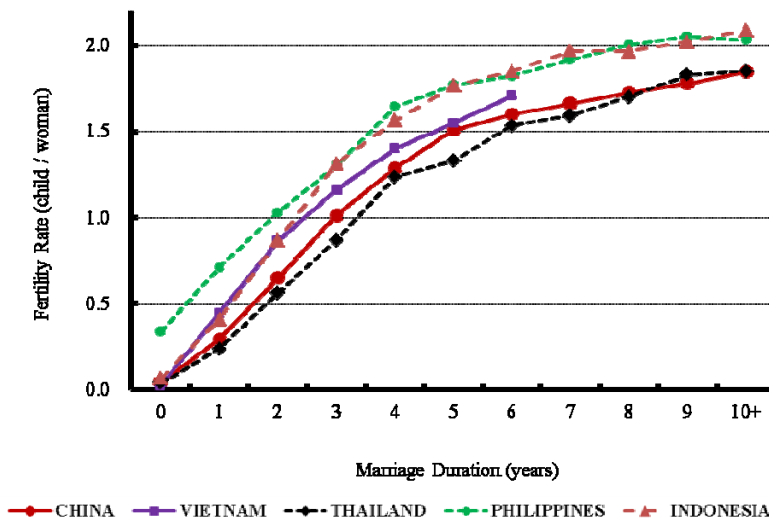
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<sup>17</sup> This three-way contrast in *TFR* persisted in the 2005 and 2008 World Population Data Sheets (WPDS): relatively high for the Philippines (3.5 in 2005 and 3.3 in 2008) and Indonesia (2.6 in both 2005 and 2008), intermediate for Vietnam (2.2 in 2005 and 2.1 in 2008), and relatively low in Thailand (1.7 in 2005 and 1.6 in

This finding suggests that somehow the fertility levels of Taiwan's foreign wives were partially affected by the prevailing fertility levels of the source countries.

Fifth, for the foreign wives from China, the predicted *LTFR* of the reference group (1.85) turned out to be substantially higher than the corresponding observed *LTFR* (1.40) shown in Figure 1. To gain further insight into this finding, it is useful to see how the reproductive outcomes of the wives of different source countries were subject to the effects of the other explanatory factors.

**Figure 3: Predicted fertility rates of the reference groups of Taiwan's foreign wives from the top five source countries: by marriage duration**



2008) and China (1.6 in both 2005 and 2008). Although the values in the WPDS were for the most recent year, which may not be the current year in some cases, this contrast has undoubtedly prevailed in the recent decade.

## 5.2. Effects of explanatory factors on the predicted lifetime fertility rate

To quantify the effects of an explanatory factor (e.g., spousal age gap) on the predicted *LTFR*, we proceed in the following two steps. First, in the model for each nationality, we let the dummy variable for representing the highest marriage duration be 1 and let all other dummy variables representing other marriage durations and all other explanatory factors ( $X_{im}$ ) be 0. This specification is called the "reference specification" and yields the predicted *LTFR* for the "reference group" of each nationality: 1.85 for the Chinese, 1.71 for the Vietnamese, 2.09 for the Indonesians, 1.85 for the Thais, and 2.03 for the Filipinas. These values are shown in the first row in Table 2.

Second, the effects of the explanatory factor in question are shown as the differences in the predicted *LTFR* from the corresponding value of the reference group. For example the effect of lengthening the spousal age gap from "less than 10 years" to "10-14 years" would result in a decrease by 0.04 children per woman for the Chinese. To find this effect from the model for the Chinese, we modify the "reference specification" by letting the dummy variable representing the "10-14 years" category be 1, so that the model can generate the predicted *LTFR* for this category, which turns out to be 1.81 children per woman. The effect in question is then represented by the difference of this value from the predicted *LTFR* of the "reference group." Similarly to find the effect of lengthening spousal age gap to "15-19 years," we modify the "reference specification" by letting the dummy variable representing the "15-19 years" category be 1, so that the model can generate the predicted *LTFR* for this category, which turns out to be 1.70 children per woman for the Chinese. The effect in question is then represented by the difference of this value from the predicted *LTFR* of the "reference group," which turns out to be -0.15 children per woman.

The effects of all explanatory factors on the predicted *LTFR* computed in this way are shown in Table 2. Since some of the estimated coefficients are not significantly different from zero, some of the effects turn out to be zero and are represented by "----" in the table. It is important to keep in mind that the non linear nature of the statistical model implies that the joint effect of two or more factors is in general not simply additive. For example to assess the joint effect of being in the "36-44 years" category of marriage age and being in the "20+ years" category of spousal age gap for the Chinese, we modify the "reference specification" by letting the two relevant dummy variables be 1 and find out that the joint effect is -1.49, which is somewhat larger in magnitude than the sum of -1.09 (the effect of the marriage age) and -0.37 (the effect of spousal age gap).



**Table 2: Effects of explanatory factors on the lifetime fertility rates of the foreign wives of Taiwanese husbands: based on the application of a multinomial logit model to the micro data of the 2003 census of foreign spouses**

Explanatory Factor	Source Country				
	China	Vietnam	Indonesia	Thailand	Philippines
Reference Group	1.85	1.71	2.09	1.85	2.03
1. Age at Marriage (ref.= 19-24)					
15-18 years	<b>-0.23</b>	-0.06	----	<b>0.26</b>	----
25-29 years	-0.12	-0.10	-0.09	-0.16	-0.10
30-35 years	<b>-0.37</b>	<b>-0.26</b>	<b>-0.36</b>	<b>-0.35</b>	<b>-0.32</b>
36-44 years	<b>-1.09</b>	<b>-0.85</b>	<b>-1.25</b>	<b>-1.06</b>	<b>-0.89</b>
2. Spousal Age Gap (ref.= less than 10 yrs)					
10-14 years	-0.04	----	----	----	-0.01
15-19 years	-0.15	-0.03	----	-0.11	----
20 or more years	<b>-0.37</b>	-0.19	-0.15	<b>-0.26</b>	<b>-0.37</b>
3. Marital Status (ref.= Married)					
Separated	<b>-0.92</b>	<b>-0.54</b>	<b>-0.33</b>	<b>-0.26</b>	-0.09
Divorced	<b>-0.33</b>	-0.08	-0.08	----	----
Widowed	-0.11	----	----	----	----
4. Wife's Remarriage Status (ref.= other)					
2nd Marriage	<b>-0.39</b>	<b>-0.22</b>	<b>-0.20</b>	<b>-0.50</b>	-0.11
5. Living Arrangement (ref.= other)					
With Parent	0.07	0.08	0.06	<b>0.21</b>	0.09
6. Wife's Education (ref.= less than High Sch.)					
High School	-0.04	----	----	----	----
College or University or higher	-0.13	----	----	----	0.03
7. Husband's Education (ref.= less than High Sch.)					
High School	-0.05	-0.03	-0.11	----	----
College or University or higher	-0.11	-0.01	<b>-0.20</b>	----	----
8. Husband's Veteran Status (ref.= other)					
Veteran	-0.07	-0.02	-0.12	<b>-0.41</b>	----
9. Wife's Employment Status (ref.= other)					
Fixed Job	-0.03	<b>-0.21</b>	-0.09	-0.15	<b>-0.20</b>
10. Husband's Employment Status (ref.= other)					
Fixed Job	0.02	0.06	-0.01	0.06	-0.03
11. Husband's Health Status (ref.= Able)					
Disabled	-0.02	-0.06	-0.05	----	-0.03
12. Residence (ref.= other)					
Metropolitan Area	-0.08	-0.07	-0.04	-0.12	-0.17
Maximum Achievable LTFR	1.93	1.85	2.14	2.09	2.14

Note: The effects with a magnitude of less than 0.20 children per woman are considered to be modest. The effects that are not modest are highlighted in the table.

With respect to the effects of marriage age, the foreign wives of all five source countries shared the same pattern of decreasing *LTFR* as marriage age became increasingly older than 19-24 years. The magnitudes of the decrease were progressively larger: about 0.1 children for the 25-29 age group, about 0.3 children for the 30-35 age group, and about 1 child for the 36-44 age group. The effects of marrying at the very young ages of 15-18 were inconsistent among the five nationalities: relative to those with marriage ages of 19-24, there was a deficit of 0.23 children for the Chinese, a deficit of 0.06 children for the Vietnamese, a surplus of 0.26 children for the Thais, and a zero

effect for the Indonesians and the Filipinas. The deficits for the Chinese and Vietnamese wives required further investigation, because they were inconsistent with the simple idea that longer exposure to the risk of pregnancy tends to result in higher *LTFR*.

The negative effects of *spousal age gap* up to 15-19 years on *LTFR* turned out to be either modest or nonexistent for the wives from each of the five source countries, with the largest effect being only 0.15 children for the Chinese. The negative effects of having the longest age gap of 20+ years were moderate for the Chinese (by 0.37 children), the Filipinas (by 0.37 children) and the Thais (by 0.26 children) but were modest for the Vietnamese (by 0.19 children) and the Indonesians (by 0.15 children). In short, spousal age gap had little effect on *LTFR*, except when it was very large. Note that we chose to let the reference category be "less than 10 years," after we had found that the differences among the "< -5," "-5 to -1," "0 to 4," and "5 to 9" categories did not have any significant effect.

With respect to the effects of *marital status* on *LTFR*, widowhood had only a modest negative effect on the Chinese (by 0.11 children) and no effect on all Southeast Asian nationalities. The negative effect of being divorced was moderate for the Chinese (by 0.33 children), modest for the Vietnamese and the Indonesians (both by 0.08 children) and nonexistent for the Thais and Filipinas. For the wives from each of the five source countries, the negative effect of being separated was greater than those of being divorced and widowed. It was very strong for the Chinese (by 0.92 children), rather strong for the Vietnamese (by 0.54 children), moderate for the Indonesians (by 0.33 children) and the Thais (by 0.26 children), and modest for the Filipinas (by 0.09 children). It is likely that fake marriages were more prevalent among the separated than among those of other marital statuses.

The current marriage being the *second marriage* indeed had a negative effect on the *LTFR* of every nationality. It was rather strong for the Chinese (by 0.39 children) and the Thais (by 0.50 children), moderate for the Vietnamese (by 0.22 children) and the Indonesians (by 0.20 children), and modest for the Filipinas (by 0.11 children).

*Living with parent* had the expected positive effect on the *LTFR* of every nationality. However the effects were not strong. It was moderate for the Thais (by 0.21 children) and modest for the Chinese (by 0.07 children), the Vietnamese (by 0.08 children), the Indonesians (by 0.06 children), and the Filipinas (by 0.09 children).

The effects of *wife's educational attainment* on *LTFR* were very modest and mostly nonexistent. It had no effect on the Vietnamese, the Indonesians, and the Thais. The expected negative effects could only be detected for the Chinese (by 0.04 children for achieving high school graduation, and by an additional 0.09 children for achieving a college degree). In the case of the Filipinas, the achievement of a college degree was somehow associated with an increase by 0.03 children.

The effects of *husband's educational attainment* on *LTFR* were mostly either rather modest or nonexistent. They were nonexistent for the Thais and the Filipinas. Its only moderate effect was a reduction by 0.20 children for the Indonesians whose

husbands had achieved college or higher education, relative to those with less than high school education. This moderate reduction in *LTFR* resulted mainly from a shift of a probability (10%) from the three-child alternative primarily to the two-child alternative and secondarily to one-child alternative. It had no effect on the probability of being childless. In other words the reduction resulted mainly from a compression of reproduction towards the ideal family size of 2 children.

Except for the Thais, the expected negative effects of *being the wife of a veteran* on *LTFR* were mostly modest or nonexistent. They were modest for the Chinese (by 0.08 children), the Vietnamese (by 0.02 children) and the Indonesians (by 0.12 children), and nonexistent for the Filipinas. For the Thais, the effect was a rather large reduction by 0.41 children, which resulted mainly from decreases in the probabilities of having two children (by 17%) and three children (by 7%) and increases in the probabilities of having one child (by 13%) and no child (by 11%). Essentially, the decrease resulted from a downward shift away from the ideal family size of 2 children.

With respect to *wife's employment status*, having a fixed job had a negative effect on the *LTFR* of the wives from each of the five source countries. The effect was moderate for the Vietnamese (by 0.21 children) and the Filipinas (by 0.20 children) and modest for the Thais (by 0.15 children), the Indonesians (by 0.09 children) and the Chinese (by 0.03 children). In the case of the Vietnamese and Filipinas, the moderate decrease in *LTFR* resulted mainly from a shift of probability from the two-child alternative to the one-child and childless alternatives.

With respect to *husband's employment status*, having a fixed job had very modest and somewhat inconsistent effects on *LTFR*. It had positive effects on the Chinese (by 0.02 children), the Vietnamese (by 0.06 children), and the Thais (also by 0.06 children). It had negative effects on the Indonesians (by 0.01 children) and the Filipinas (by 0.03 children). The increase in *LTFR* for the Vietnamese resulted mainly from a shift of probability from the one-child alternative to the two-child alternative, whereas the increase in *LTFR* for the Thais resulted mainly from a shift of probability from the no-child alternative to the two-child alternative. It is worth noting that underneath the near zero effects on *LTFR* for the Chinese and the Indonesians was a clear compression of probability towards the two-child alternative (by 5%) from both sides. In other words, *having a husband with a fixed job enhanced the ability to achieve the two-child ideal family size but had little effect on the fertility level.*

*Having a disabled husband* had no effect on the *LTFR* of the Thais and only reduced the *LTFR* of the wives from the other four source countries to a modest extent: by 0.06 children for the Vietnamese, 0.05 children for the Indonesians, 0.03 children for the Filipinas, and 0.02 children for the Chinese. In the case of the Vietnamese and Indonesians, the decrease in *LTFR* resulted mainly from a shift of probability from the two-child alternative to the one-child alternative.

Finally, *residence in metropolitan areas* had negative effects on the *LTFR* of the wives from all five source countries. However, the effects were all modest, ranging from

0.04 children for the Indonesians to 0.12 children for the Thais and the Filipinas. The decrease for the Thais resulted mainly from shifting probability from the three-child alternative to all three lower alternatives, whereas the decrease for the Filipinas resulted mainly from shifting probability from the two-child alternative to the two lower alternatives.

It is now clear that the main reasons for the observed *LTFR* of Chinese wives (1.40 children) to be much lower than those of the wives of other nationalities are the following: their ages at marriage were relatively advanced; they were more prone to being separated or divorced; their spousal age gaps were relatively high; their current marriages were more likely to be their second; they were less likely to live with the husband's parents; and they were more prone to marrying veterans (see Table 1).

To the extent that these explanatory factors are subject to policy interventions, and to the extent that raising the lifetime fertility of foreign wives towards the replacement level is desirable, the above findings suggest that the effects of the intervention are likely to differ systematically among the five source countries. For example, a policy designed to reduce the rates of separation and divorce would have a greater fertility-enhancing effect on Chinese wives than on Southeast Asian wives. In contrast, a policy designed to reduce the burden on working wives would have a greater fertility-enhancing effect on Southeast Asian wives than on Chinese wives.

How much can the *LTFR* of each nationality be raised by policy intervention? To help answer this question, we define the *maximum achievable LTFR* for each nationality as the predicted *LTFR* of a group of wives with the most favorable values of all the explanatory factors. It turned out that the *maximum achievable LTFR* is 1.93 children for Chinese wives, 1.85 children for Vietnamese wives, 2.14 children for Indonesian wives, 2.09 children for Thai wives, and 2.14 children for Filipina wives. Since these values cluster around the replacement level, it seems that the most that can be hoped for is that the foreign wives reproduce just enough daughters to match their own number. Since it is unlikely that policy measures can manage to induce such changes as making all individuals marry before they are 25 years old, all spousal age gaps to be less than 10 years, all marriages to be the first marriage and to remain intact until the end of fecundity, and all wives to co-reside with parents, the probability for achieving these maximal values is practically zero. Therefore, our overall assessment is that the *reproductive contribution of the foreign wives will remain at the sub-replacement level, irrespective of policy interventions*. It is worth noting that the maximum *LTFR* of the foreign wives from each of the five top source countries was lower than the *LTFR* of the corresponding ever-married women in Taiwan, and that the Vietnamese wives showed the fastest increase in number in recent years and had the lowest maximum achievable *LTFR* among those from the top five source countries.

### 5.3. Effects of explanatory factors on the predicted probability of lifetime childlessness

The steps for quantifying the effects of explanatory factors on the predicted probability of lifetime childlessness is the same as those used in quantifying the effects on the predicted *LTFR*. In Table 3, we see that the predicted probability of lifetime childlessness of the reference group of each nationality was not high: 4% for the wives from China, Indonesia, and Philippines, 5% for those from Vietnam, and 8% for those from Thailand.

With the minor exception of the 15-18 age group, *age at marriage* had an increasingly strong positive effect on the risk of lifetime childlessness: the increase in the predicted probability of lifetime childlessness was modest for the 25-29 age group (ranging from 1% for the Thais to 3% for the Filipinas), moderate for the 30-35 age group (ranging from 7% for the Thais to 11% for the Chinese), and very large for the 36-44 age group (ranging from 34% for the Filipinas to 46% for the Indonesians).

Over a wide range up to 19 years, *spousal age gap* had either no effect or a modest effect on the risk of lifetime childlessness. The effect of having the largest age gap of 20+ years became moderate for the Chinese (10%), the Thais (13%), and the Filipinas (10%) but remained modest for the Vietnamese (3%) and the Indonesians (3%).

With respect to *marital status*, being separated increased the predicted probability of lifetime childlessness for every nationality, with the effect being very strong for the Chinese (39%), rather strong for the Vietnamese (20%), moderate for the Thais (13%) and Indonesians (9%), and modest for the Filipinas (4%). The effect of being divorced was much weaker than the effect of being separated. Its effect was moderate for the Chinese (13%), modest for the Vietnamese (5%) and Indonesians (4%), and zero for the Thais and the Filipinas. The effect of being widowed was trivial or non-existent. The current marriage being the *second marriage* had a positive effect on the predicted probability of lifetime childlessness for every nationality: it was moderate for the Chinese (13%), the Thais (13%) and Indonesians (7%), and modest for the Filipinas (5%) and Vietnamese (4%).

The remaining explanatory factors mostly had modest or zero effects. *Living with parent* had a negative effect on the predicted probability of lifetime childlessness for every nationality: its effects were all modest, and ranged from -5% for the Thais to -1% for the Indonesians. In contrast, *residing in a metropolitan area* had a positive effect on the predicted lifetime probability of childlessness for every nationality: its effects were limited to only 1% or 2%. The effect of *having a husband with disability* turned out to be nonexistent for the Thais and trivially positive for the other nationalities (1% or 2%).

**Table 3: The effects of explanatory factors on the predicted probability of lifetime childlessness of the foreign wives**

Wives of Taiwanese Husbands		Source Country of Foreign Wives				
Explanatory Factor		China	Vietnam	Indonesia	Thailand	Philippines
Reference Group		0.04	0.05	0.04	0.08	0.04
1. Age at Marriage (ref.= 19-24)						
	15-18 years	0.05	0.02	----	-0.04	----
	25-29 years	0.02	0.02	0.02	0.01	0.03
	30-35 years	<b>0.11</b>	<b>0.08</b>	<b>0.09</b>	<b>0.07</b>	<b>0.08</b>
	36-44 years	<b>0.45</b>	<b>0.38</b>	<b>0.46</b>	<b>0.42</b>	<b>0.34</b>
2. Spousal Age Gap (ref.= less than 10 yrs)						
	10-14 years	0.00	----	----	----	0.01
	15-19 years	0.02	0.00	----	<b>0.06</b>	----
	20 or more years	<b>0.10</b>	0.03	0.03	<b>0.13</b>	<b>0.10</b>
3. Marital Status (ref.= Married)						
	Separated	<b>0.39</b>	<b>0.20</b>	<b>0.09</b>	<b>0.13</b>	0.04
	Divorced	<b>0.13</b>	0.05	0.04	----	----
	Widowed	-0.01	----	----	----	----
4. Wife's Remarriage Status (ref.= other)						
	2nd Marriage	<b>0.13</b>	0.04	<b>0.07</b>	<b>0.13</b>	0.05
5. Living Arrangement (ref.= other)						
	With Parent	-0.02	-0.02	-0.01	-0.05	-0.02
6. Wife's Education (ref.= less than High Sch.)						
	High School	-0.00	----	----	----	----
	College or University or higher	0.01	----	----	----	-0.02
7. Husband's Education (ref.= less than High Sch.)						
	High School	0.00	0.00	0.00	----	----
	College or University or higher	0.01	0.01	0.00	----	----
8. Husband's Veteran Status (ref.= other)						
	Veteran	0.02	0.01	0.03	<b>0.11</b>	----
9. Wife's Employment Status (ref.= other)						
	Fixed Job	0.01	<b>0.06</b>	0.03	<b>0.07</b>	<b>0.06</b>
10. Husband's Employment Status (ref.= other)						
	Fixed Job	-0.01	-0.01	-0.01	-0.03	0.00
11. Husband's Health Status (ref.= Able)						
	Disabled	0.01	0.02	0.01	----	0.01
12. Residence (ref.= other)						
	Metropolitan Areas	0.02	0.01	0.01	0.02	0.02

Note: The effects with a magnitude of less than 0.06 (or 6%) are considered to be modest. The effects that are not modest are highlighted.

Of particular interest is the finding that both *wife's* and *husband's educational attainments* had practically no effect on the predicted probability of lifetime childlessness. However, the effects of *having a fixed job* differed by gender, though the effects were mostly modest. Wives with a fixed job were somewhat more likely to be childless (by 7% for the Thais, 6% for the Vietnamese and Filipinas, 3% for the Indonesians, and 1% for the Chinese), whereas having a husband with a fixed job reduced the probability of childlessness slightly (by 3% or less).

In sum, the highest risks of lifetime childlessness resulted from (1) marrying beyond the mid-30s and (2) having a separated marital status. The latter was probably connected to a high prevalence of fake marriages. The probability of lifetime childlessness tended to

increase moderately by marrying in the mid-30s, having a very large spousal age gap of 20+ years, having the divorced marital status (for the Chinese only), having the current marriage be the second marriage, marrying a veteran (for the Thais only), and having a fixed job. Educational attainment had practically no effect on the probability of lifetime childlessness.

## **6. Contextualization of the empirical findings**

As late as 1970, around the time when western European countries started to enter into the Second Demographic Transition towards the entrenchment of sub-replacement fertility levels, the TFR of Taiwan was still at a high level of 4.0, which was even higher than the TFRs of Australia, Canada, and the United States at the peaks of their post-World War II baby-booms (Romaniuc 1984; McDonald 2000c). Rapid economic growth and successful promotion of a popular family planning program through the 1970s helped the rapid transition of Taiwan's TFR to the replacement level in 1983 (Chang, Freedman, and Sun 1987; Sun 2001). Several developments since the 1980s helped set the context for an entrenched sub-replacement fertility level that is important for understanding the reproductive performances of both native-born and foreign wives in Taiwan.

One of these developments was a rapid progress towards gender-equality in individual-oriented institutions (especially the education system), accompanied by the slow progress of gender-equality in family-oriented institutions (McDonald 2000a, 2000b, 2007; Yang and Tsai 2007). This development has not only helped raise the opportunity cost of having children but also made the lives of married women stressful and exhausting. Consequently, more women were motivated to postpone, or even to abstain from, marriage and childbearing.

Another development was the progressive entrenchment of neo-liberalism. Motivated by profit maximization and threatened by market competition, businesses in Taiwan have reduced the job security and real wages of their workers, especially the new entrants and those without sophisticated skills. Young adults became increasingly pessimistic about their ability to have a steady income sufficient to sustain the expenses of a household. The entrenchment of neo-liberalism has also made it impossible for the allocation of sizable public funds to child benefits and to childcare and maternal or paternal leave programs.

There were other relevant developments such as the decrease in the willingness of young wives to co-reside with their husbands' parents and the increase in the risk of divorce (Yang and Tsai 2007). It used to be common in Taiwan for the elderly to co-reside with their married sons and to provide the essential service of caring for their children. As such intergenerational co-residence became less common, the arrangement

of, and the payment for, childcare became a more serious challenge for double-income couples, especially those with low income and unstable employment. With respect to the risk of divorce, the annual divorce rate for married women in Taiwan has increased from 0.39% in 1980 to 1.32% in 2003 and then declined somewhat to 1.13% in 2008.<sup>18</sup> The proportion of women aged 15+ who were divorced increased from 1.0% in 1980 to 5.4% in 2003 and 6.9% in 2008.<sup>19</sup> Married women fearing divorce are more likely to focus on the development of their own income-generating capacities and to postpone or avoid childbirth, whereas divorced women tend to avoid being pregnant.

Although repeated surveys have shown that the average number of children desired by the married women in Taiwan continued to be greater than two (DGBAS 2002 and 2006), the above-mentioned developments have combined to create a context in which the TFR of Taiwan has been pulled down to an extremely low level of about 1.1 or 1.2 in recent years. Being abruptly inserted as individuals into the households in Taiwan, the foreign wives were undoubtedly subject to the constraints of this context. The effects of these constraints were particularly strong on the wives from the two countries with the highest fertility (Indonesia and the Philippines) so that their *LTFRs* became substantially lower than the TFRs of their home countries. Although in Taiwan the foreign wives from these two countries remained more fertile than the foreign wives from the other three major source countries, the difference in their *LTFRs* in Taiwan, especially after controlling for the effects of other factors, became much smaller than the difference in the *TFRs* of their countries of origin. The pervasiveness of the constraints of this context was also reflected by our findings that the negative effects of wife's educational attainment were mostly non-existent or rather modest in the case of the wives from China<sup>20</sup>, and that the positive effects of co-residence with husband's parents on *LTFR* were either modest or at best moderate (Table 2).

A better understanding of the reproductive contributions of the foreign wives depends on the awareness of the possibility that for many of them, the escape from individual and/or familial economic hardship was a major motivation for their current marriage, and the fact that many of them had maintained and wanted to maintain a long-term connection with the kin and friends left behind (Nguyen and Tran 2010). Many of the marriages were rather similar to a business contract with an uncertain long-term

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<sup>18</sup> These divorce rates were computed by the authors from the data of MOI at [www.ris.gov.tw/gateway](http://www.ris.gov.tw/gateway) in two tables: "Annual Numbers of Marriages and Divorces, Crude Marriage Rates and Crude Divorce Rates" (created on May 19, 2009) and "Annual Population Sizes (Aged 15+) by Sex and Marital Status" (created on February 19, 2009). We restricted the denominator to include only married women.

<sup>19</sup> The values of the proportion being divorced were also computed by the authors from the data in the second table mentioned in the previous footnote.

<sup>20</sup> It is likely that the lack of importance of the wife's educational attainment on the reproductive outcome is partly due to the fact that the Taiwanese government assumes that households with a foreign spouse (especially one with little education) tend to have very limited resources for raising and educating their children, and hence offer them subsidies to practice fertility control (Douglass 2006).



commitment to remain in Taiwan (Wang and Chang 2002). This could be especially true for those whose current marriage was their second marriage, because they were more likely to have one or more dependent children left in their home country. They tended to make regular remittances to their kin and often urged or pressured their Taiwanese husbands to build a house in their hometown. Reproduction for the Taiwanese husband's family tended to be avoided or restricted. Thus, we were not surprised to find that for the wives from China and Thailand whose marriages were more likely to be a second marriage (Table 1), the negative effect of second marriage on *LTFR* was as large as 0.39 and 0.50 children, respectively (Table 2).

With respect to some systematic biases in the under-coverage of the 2003 census, we suspect that in addition to the greater under-coverage of the wives from China than their Southeast Asian counterparts, those whose marital status was separated or divorced were less well covered than those who had the married status. Our suspicion was partly based on the finding that as many as 25% of the under-enumerated cases were due to disappearance, and the finding that only 1.4% of the foreign wives in our sample were shown to be divorced, whereas 5.4% of all women aged 15+ in Taiwan in 2003 had this marital status. It was shown in Liaw, Ochiai, and Ishikawa (2010) that in Japan foreign wives were more prone to being divorced than were native-born wives. This was likely to be true in Taiwan, too. Due to such biases in the under-coverage of the census, the real fertility level of the foreign wives in Taiwan was likely to be somewhat lower than what was revealed in our analysis.

## 7. Conclusions

We have found that the overall fertility level of Taiwan's foreign wives from the top five source countries was lower than that of their Taiwanese counterparts, and that the rate was much lower than two children per woman. Despite their low fertility level, as marriage duration increased, their distribution among the birth alternatives shifted towards a pattern in which the highest probability was for the two-child alternative. This was true for each of the five major source countries. Thus, the foreign wives were similar to native-born wives in having the ideal family size of two as the modal choice. The entrenchment of the sub-replacement fertility was accompanied by high probabilities of lifetime childlessness, ranging from about 10% for the wives from Indonesia and Vietnam to over 20% for the wives from China.

Our multivariate analysis has revealed that with respect to the effects on the lifetime fertility rates and the probabilities of lifetime childlessness of the foreign wives, marriage age was the strongest explanatory factor: it had modest effects from ages 19-24 to ages 25-29, moderate effects from ages 25-29 to ages 30-35, and very strong effects from ages 30-35 to ages 36-44. The effects of spousal age gap were far less important. Its effects

remained mostly modest up to 19 years. The effects of having the very large spousal gap of 20+ years were much smaller than the effects of marrying in the 36-44 age group.

Being divorced and especially being separated were in general associated with moderate to large deficits in fertility. Both the actual marriage breakup and the fear of it could result in a lower fertility. Furthermore, the low fertility of the separated could be partly attributed to the possibility that those with fake marriages were more likely to have a separated marital status. For a set of plausible reasons, the current marriage being the second marriage turned out to have clear negative effect on fertility and positive effect on the risk of lifetime childlessness.

As expected, living with parent turned out to have positive effects on fertility level and negative effects on the risk of lifetime childlessness. But, its effects on fertility level were quite modest, and its effects on the risk of childlessness were negligible. Undoubtedly, there were households in which the daughters-in-law were expected to provide substantial services to the parents-in-law, so that the net downward transfer of services may be small or even negative.

The foreign wives with a fixed job tended to have a somewhat lower fertility and a somewhat higher probability of lifetime childlessness. Since both holding a fixed job and rearing a child are time intensive, such connections were difficult to avoid in Taiwan where the progress towards gender equality was less advanced in family than in non familial institutions. However, marriage to a husband with a fixed job turned out to have mixed effects on fertility level and slight negative effects on the probability of lifetime childlessness. Its effect lay mainly in a moderate compression of reproduction towards the ideal family size of two children. It seems that husband's greater job security enhanced somewhat the chance of achieving the ideal family size.

Despite the fact that better educated women were the leaders in Taiwan's fertility transition towards the replacement level, the educational attainment of the foreign wives turned out to have little effect on their fertility level and practically zero effect on their risk of lifetime childlessness. This finding suggests that irrespective of their levels of educational attainment, the foreign wives had similar knowledge of, and access to, effective means of contraception, and were similarly subject to the societal constraints on reproductive behavior.

To the extent that it is desirable to increase the fertility level of the foreign wives, we can make the following policy suggestions from our findings. First, marriage agencies should be persuaded to look for potential brides who are less than 30 years old. Second, efforts should be made to provide consulting services so that the risk of marriage break up can be reduced and intergenerational co-residence can be sustained. Since some of the separations and divorces were due to the fakeness of the original marriages, efforts should also be made to reduce fake marriages. Third, marriage agencies should be persuaded to focus on never married women. Fourth, there is no need to prefer less educated women, because the negative effect of their educational attainment on their fertility is either nonexistent or very modest. Fifth, since irrespective of any policy

measure, the fertility level of Taiwan's foreign wives will remain sub-replacement, measures to deal with the negative effects of rapid population aging (e.g., raising retirement age) should be considered and implemented.

Although the fertility level of Taiwan's foreign wives is below replacement, the continual expansion of their stock in Taiwan implies rapidly increasing numbers of their children pouring into Taiwan's school system: the number of these children enrolled in Taiwan's primary and middle schools increased from 30,040 in 2003 to 155,144 in 2009 at an extremely high average growth rate of 27% per year (MOI 2010). Ironically, the Vice Minister of Education remarked in 2004 that "the low quality of education in Taiwan was due to the increasing numbers of children delivered by migrant mothers dragging standards down" (Huang 2006: 461). With limited household resources, these students as well as their mothers should be provided extra help by the school system and NGOs, including language training classes for the mothers from Southeast Asian countries. Governments at all levels as well as human rights organizations should also play a role in reducing negative stereotyping and scapegoating of the foreign spouses and their children by the native-born population. Successful integration into the households and the society of Taiwan is essential to maintaining and enhancing the quality of the next generation.

Finally, we mention that other researchers have also used the same micro data to carry out multivariate analysis of various aspects of the reproductive behaviors of Taiwan's foreign wives (Chen 2008; Kojima 2007; Yang and Schoonheim 2010). Their studies differ from ours with respect to the definitions of the dependent variable, the selections of sub-samples, the choices of statistical models, and the methods of quantifying the effects of explanatory factors. Without attempting at studying lifetime reproductive outcomes, Yang and Schoonheim (2010) focus on the transitions from marriage to the first birth and from the first birth to the second birth. For a relatively detailed comparison of our work with those of Chen (2008) and Kojima (2007), the readers are referred to our lengthier working paper (Liaw, Lin, and Liu 2009).

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