

# Women's Labor Force Participation and Occupational Choice in Taiwan

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## Abstract

This paper studies the effects of changes in occupational composition to changes in the overall female labor force participation rate in Taiwan. Using the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Survey of Family Dynamics, the authors estimate a linear probability model of women's labor force participation given time since marriage and initial occupation. There is a higher probability of participation after marriage for women in white-collar occupations than for those in blue-collar occupations. The former are also more likely to remain in the labor force in the presence of young children. Changes in occupational structure account for 30% of the observed increase in the female labor force participation rate from 1979 to 1998. This supports the hypothesis that changes in occupational structure during economic development play a significant part in determining overall female labor force participation.

# 1 Introduction

A number of explanations have been proposed to explain the rising trend of women's labor force participation in developing countries. For example, Goldin (1995) uses data from a variety of countries to show that the female labor force participation rate tends to trace out a U shape as the occupational composition of the female labor force changes. She points to the ability of women to enter and remain employed in mainstream occupations at different phases of economic transition, which largely depend on education level and cultural values, as the main determinant of the U shape. One reason for the initial decline is that industrialization usually increases work opportunities for men relative to women (Mammen and Paxson 2000). Since women, particularly married women, often face social norms barring them from taking up blue-collar jobs, their labor force participation declines as industrialization proceeds. However, as development continues, women receive more education and start to re-enter the labor force as white-collar employees, causing participation to rise again.

The rise in labor force participation, however, is limited to those who are fortunate enough to be qualified for the new work opportunities in the first place. In the United States, Juhn and Murphy (1997) find that women married to wealthy husbands increased their participation substantially more in the 1980s and 1990s than those married to poorer ones. They speculate that employment opportunities in these decades might have been unusually skewed toward women in high-wage households. If so, it means that rigidity of occupational choice among women of different backgrounds may have important implications on the decision to partic-

ipate in the labor market. This is consistent with Goldin's (1989) observation that occupational choice is an important factor in determining whether a married woman persists in remaining in the labor force or not after entry, which in turn has a substantial effect on the aggregate labor force participation rate. For example, she finds that women in 1939 who started work in the manufacturing sector tended to spend 10% less time in the labor force than those who started with clerical or professional work.

This paper aims to provide a quantitative assessment of the importance of occupational composition in determining female labor force participation. Specifically, this paper uses data on women's work histories from Taiwan to examine the relationship between a woman's initial occupation before marriage and her subsequent participation in the labor force after marriage and childbirth. Observed occupational composition reflects both the availability of job opportunities for women, which is shaped by growth of specific industries during economic development, and the ability of women to take up employment, which depends on, among other things, their level of education. If different occupations have different implications for a woman's subsequent decisions to participate, and if occupational choice is persistent across a woman's lifetime, then changes in occupational structure will have a long-term effect on overall female labor force participation.

The next section surveys the existing literature on women's employment in Taiwan and discusses the labor force participation rate and the occupational composition of the female labor force. The third section examines effects of women's occupation before marriage on their subsequent participation in the labor force.

The fourth section explores the implications of cohort-specific differences in initial occupation and the likelihood of being employed before marriage on the aggregate female labor force participation rate.

## **2 Literature Review and the Taiwanese Case**

The labor force participation rate of women in Taiwan has been steadily increasing since the turn of the century. Up until the 1940s, the labor force participation rate for women was low and those women who did work were largely concentrated in the agricultural sector, in family farms. During the 1950s, however, women started to enter the commerce and service sectors in increasing numbers. Then, in the 1960s and 1970s, the rapid development of Taiwan's clothing and textile industries prompted large numbers of women to enter the manufacturing sector as well, either in factories or working from home by a subcontracting arrangement. These industries for the most part preferred unmarried women as employees, to the point where, by 1967, a labor shortage of young women and an unemployment problem for young men persisted at the same time (Chen 2000).

For the most part, women were preferred because they were less expensive, obedient, and simple to recruit and dismiss in response to fluctuations in order volume from overseas. They also tended to leave after they married, thus saving the cost of pensions and experience-based wage increases that hiring a male labor force would incur (Chen 2000). This is consistent with contemporaneous research on desired family size. Speare, Speare and Lin (1973) found, for example, that

women's desired number of children at the time in Taiwan (on average, 3.2 among married women) did not change appreciably with participation in the labor force, which is reasonable if they didn't intend to stay in the labor force for very long.

By the 1980s, however, the pattern of women's employment in Taiwan changed substantially. Chen (2000) notes that starting from the mid-1980s, the Taiwanese government actively sought to utilize the potential of women in the labor force, providing vocational training for this purpose and encouraging firms to make part-time work arrangements available to married women.

The data show that married women did start to enter the labor force in greater numbers; Table 1 shows the labor force participation rate and occupational composition of the married female labor force aged 20 through 50 from 1979 through 1992. The data are from the May supplements of Taiwan's annual Labor Force Survey, which is a survey that Taiwan's Directorate-General of Budget, Accounting and Statistics conducts of approximately 20,000 households every year. Labor force participation is shown for both full-time and part-time work. Full-time is defined as working 40 hours or more in the previous week, and part-time is defined as working at least one hour in the previous week but less than 40.

Table 1 shows that the labor force participation rate for working either full-time or part-time increased by approximately 14.8% over the 13 years from 1979 to 1992, with clerical workers, service workers and production workers contributing the largest increases to the labor force participation rate in absolute terms. Women's labor force participation also shifted toward more full-time work; the absolute proportion of women working as clerical workers, virtually all of whom

work full-time, increased by 4.8%. Even within service workers and production workers, where part-time work is more common, the increase in participation in these occupations was primarily driven by increases in full-time labor force participation.

Moreover, Stokes and Hsieh (1983) find that in 1980 the number of desired children for women in certain occupations declined, which is consistent with an intention to spend more time in the labor force. The desired number of children for women in professional, technical and clerical occupations in 1980 dropped to 2.6, as opposed to 3.4 for women in service or production occupations. Women in these occupations also became progressively more educated, which may have contributed further to this drop. Freedman, Chang and Sun (1994) find that in 1991 the mean number of desired children for women in any occupation dropped still further to 2.4 (they measure it as having been 2.8 among women in 1980). They also characterize the decline in measured fertility for Taiwanese women since 1983 as largely attributable to delays in marriage and cite women's increasing participation in the labor force as a factor they expected to continue contributing to this trend.

Altogether, the findings of Freedman et al. (1994) are in marked contrast to the findings of Speare et al. (1973), who two decades earlier found that labor force participation and intended number of children were unrelated. One reason for this may be that the women's labor force participation of two decades earlier was typically of much shorter duration than the participation of the most recent two decades. Additionally, women with training that makes them more valuable in the

labor force may stay in the labor force longer. Therefore, since a woman's initial occupation can exert a substantial influence on her subsequent career options and earning potential in the formal sector, her initial occupation may influence her decisions to participate in the labor force throughout her life. It is also worth noting that prohibitions against discrimination on the basis of marriage and childbirth were not enforced until the mid-1990s and, in the manufacturing and service industries, women were often subject to dismissal on either of these grounds. In other occupations, however, this discrimination was less pronounced (Chen 2000).

The next section uses data from two fertility surveys in Taiwan (Sun and Chang 1973, Sun, Chang, Lee and Lin 1986) and the Taiwanese Panel Study of Family Dynamics (Chu, Chang and Tsai 1999), all of which ask detailed questions on women's work histories, to examine the relationship between a woman's initial occupation and her subsequent participation in the labor force. It is important to note that the causality may not be due to the occupations themselves, but characteristics highly correlated with women's presence in certain occupations, like improved educational opportunities, the availability of flexible work, potential wages in the formal sector and social norms that women in these occupations may be subject to. The conclusion explores these issues in more detail.

## **3 Women's Initial Occupations and Subsequent Labor Force Participation**

### **3.1 Survey Data**

In order to more fully explore the relationship between a woman's initial occupation and her subsequent participation in the labor force, this section makes use of four surveys of married Taiwanese women, conducted in 1973, 1986, 1999, and 2000. Specifically, this section examines whether women who start out in different occupations have different tendencies to remain in the labor force after they marry or have children. The first two surveys are fertility surveys which ask detailed questions on the work history of married women in randomly selected households within randomly selected nonaboriginal townships in Taiwan. The 1973 survey surveyed 5588 women, and the 1986 survey surveyed 4312 women.

For 1999 and 2000, the first and second rounds of the Taiwanese Panel Study of Family Dynamics are used. There were 995 primary respondents in the first wave of this survey and 1959 primary respondents in the second wave, selected as a Taiwan-representative sample of people ages 36-45 and 46-65, respectively. Respondents in this survey answered detailed questions on their and household members' education experience, work history and socioeconomic characteristics. From these surveys, work histories from 837 married women were extracted in the first wave and 1631 married women in the second wave. When these four surveys are combined, there are in total work histories of 12,368 married women in Taiwan.

From these surveys, two pieces of information are of particular concern: women's occupations and whether they were working when they were married, and women's occupations and whether they were working at the time of the survey. These are useful in examining the probability of a married woman participating in the labor force, conditional on time since marriage, her birth cohort, and her occupation, if any, before she became married. It will be the case that women are more likely to work if they have been married longer.

### **3.2 Women's Initial and Subsequent Occupations in the Labor Force**

One reason that women's initial occupations have an effect on their subsequent labor force participation is that they are persistent; once a woman enters the labor force as a member of a particular occupation, she is likely to stay in that occupation. This is particularly true for white-collar jobs and those that require professional qualifications, like teachers and nurses. To demonstrate this, Table 2 shows a transition matrix giving the occupational composition of women at the time of the surveys by their occupation before marriage, conditional on having some job at the time of the survey. The data are from the fertility surveys and the Panel Study of Family Dynamics. "None" indicates that the woman did not work prior to getting married.

Table 2 shows that there is considerable persistence in occupation for married women, especially for white-collar workers, defined as teachers, nurses, and clerical workers. For example, 84.3% of women who were teachers before getting married

were still teachers if they continued to participate in the labor force. Similarly, about two-thirds of those who were nurses or clerical workers before getting married stayed as nurses or clerical workers. There was also some movement among the white-collar occupations; a few teachers and nurses moved into clerical work (6% and 7.5%, respectively), and a few nurses and clerical workers became teachers (4.5% and 2.5%). Almost no one moved into these occupations from being a service worker, a production worker, or a farm laborer, however.

Among the blue-collar occupations, there was still considerable persistence in occupation, but less so than among white-collar occupations. This may reflect the fact that white-collar occupations require more training to enter than do occupations that require less skill. This would imply that workers leaving blue-collar jobs may give up fewer wage premiums for occupation-specific training and enter other blue-collar jobs more easily. Of all the occupations, production work seemed to be the easiest occupation to enter; of women with no prior work experience who went to work after getting married, almost 35% became production workers, and the others for the most part either became service workers, farm workers or took up other blue-collar work. Additionally, substantial numbers of production workers and farm laborers took up employment as service workers later (15.5% and 11.9%), but relatively few women took up farm work if they had been in some other occupation before getting married.

The next subsection examines the relationship between women's initial occupations and their labor force participation rate after they become married.

### 3.3 A Linear Probability Model of Labor Force Participation

As a first step in determining the relationship between a woman's initial occupation and her participation in the labor force after marriage, a linear probability model is estimated where the dependent variable is whether or not a married woman is working and the independent variables are a set of indicator variables for occupation at marriage and interaction terms between these indicators and time since marriage. When  $p = 1$  indicates that the woman participates in the labor force, and  $p = 0$  indicates that she does not, the linear probability model takes the form

$$\Pr(p = 1 | i) = \beta_0 \cdot O_i + \beta_1 \cdot T_i + \epsilon_i \quad (1)$$

where  $O_i$  is a vector of indicator variables for her initial occupation, and  $T_i$  is a vector of interaction terms between  $O_i$  and the number of years elapsed since her marriage.<sup>1</sup> The coefficients on the indicator variables can be interpreted as an estimate of the probability that a woman in that occupation will stay working after getting married. The coefficients on the time since marriage interaction terms are interpreted as the marginal change in a woman's probability of working, conditional on her occupation before marriage, given that she has been married for one year longer.

The data are from the fertility surveys and the Taiwanese Panel Study of

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<sup>1</sup>Another important variable may be the length of time between when a woman finishes her education and when she gets married, since women who have been in the labor force longer before getting married may have a higher probability of staying in the labor force. However, when this variable is included, it is never significant.

Family Dynamics described earlier. These data are all cross-sectional.<sup>2</sup> Panel data were constructed from these data by making use of the retrospective questions on work history. Women over 50 were excluded because by this time they may have left the labor force due to retirement or old age. Since a panel was made out of the data, the participation of most women in the sample was observed twice, once immediately after marriage and once at the time of the survey. Full information was available for 9718 women from the fertility surveys and 1484 women from the Panel Study of Family Dynamics. Information on participation at the time of the survey only was available for 169 women from the fertility surveys and 4 women from the Panel Study of Family Dynamics. Since the women for whom full information was available were observed twice, there are 22,577 observations total. Data on current age were missing from 31 women across all four surveys, however, reducing the number of observations that could be analyzed to 22,546. Table 3 shows the results of estimating the linear probability model in (1), with standard errors given in parentheses. The standard errors were clustered by person ID when a woman appeared twice in the sample. “None” means that the woman did not work before getting married, and the estimate refers to the probability of her taking up employment after marriage.

The most striking result in Table 3 is for teachers; nearly all women who are teachers before getting married remain in the labor force, and a substantial number of nurses, clerical workers and farm laborers do as well. Women who are in the service industry, however, or who are production workers – which includes factory

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<sup>2</sup>The Taiwanese Panel Study of Family Dynamics has not re-interviewed respondents yet, so it is a cross-section for now.

workers – have a much lower probability of remaining in the labor force after they marry. These results support Chen’s (2000) observation that women in these occupations face substantial discrimination when they marry or have children. Looking at the age interaction coefficients, however, the tendency of these women to return to the labor force increases more sharply with age, which suggests that many of these women return to the labor force after a few years’ time. For example, right after getting married, the probability of woman who started in the service industry of still participating in the labor force is approximately 32%, but ten years later this probability rises to approximately 44%.

Figure 1 summarizes these results graphically. For any duration of marriage up until 20 years, the participation of women who started out in white-collar occupations is strictly higher than the participation of women who started out in blue-collar occupations. Moreover, the participation rate of women who did not work at all before marriage is much lower throughout their marriages than of women who did. Past 20 years, women start to retire so the assumption of a linear time-participation profile is not as tenable.

When women are separated into three birth cohorts, women from younger birth cohorts are more likely to either remain in the labor force after marriage or return to it after a brief spell of nonparticipation. Table 4 shows coefficients of the linear probability model in (1) estimated separately for women born prior to 1945, women born between 1945 and 1955, and women born after 1955. Teachers are uniformly very likely to stay working after marriage. Clerical workers from younger cohorts are both less likely to interrupt their work for marriage and more

likely to return to it after their work is interrupted. For example, a woman who has been married for ten years from the oldest cohort is approximately 47% likely to be working if she was a clerical worker before getting married. For the second and third cohorts these probabilities are 59% and 70%, respectively.

A similar story can be told for women who are sales and service workers, who are production workers, or who are farm workers and laborers. A woman who has been married for ten years who was a service worker before getting married is only 30% likely to be working if she was born prior to 1945. For women from the second and youngest cohorts these probabilities are 44% and 64%. Similarly, for production workers, these probabilities are 32%, 46%, and 57%. For farm workers and laborers these probabilities are 46%, 58% and 58%, respectively.

The next subsection explores to what extent a differential response to the presence of young children across occupations can explain these differences, particularly for women in the first years of their marriage.

### **3.4 Young Children and the Time-Participation Profile**

To some extent, the rising time-participation profile observed in the preceding subsection may be explained by the presence of young children. Since young children require more time and attention to raise, and are often present in the first years of marriage, part of the reason the profile rises may be because women leave their jobs when their children are born and then return as their children grow older.

In order to explore this possibility further, this subsection estimates a linear

probability model for married women's labor force participation similar to that of the preceding subsection but also including indicator variables for women's occupations before marriage interacted with the presence of a child five years of age or younger. Table 5 shows these results of estimating this linear probability model, with standard errors given in parentheses.

Looking at Table 5, once interaction terms are included for the presence of young children are included, the rising time-participation profile is attenuated by about one quarter.<sup>3</sup> This suggests that at least part of the reason newly-married women tend not to work is because they tend to have young children. For example, the marginal effect on the probability of working of a year of marriage for service workers was 1.2% from Table 3, but this drops to 0.9% when an indicator variable for the presence of a young child is included. Women in some occupations before marriage are also much less likely to be working given the presence of a child under 5 than are others. For example, all other things being equal, a teacher is only 4.4% less likely to be working if she has a young child at home, and a clerical worker is about 6.7% less likely. By contrast, a service worker is about 13% less likely to be working if she has a young child at home, and a farm worker is about 15% less likely.

The indicator variables in Table 5 can also reveal whether a woman's marriage or the birth of her first child are more important in determining her departure from the labor force. If marriage had no effect on women's labor force participation, the

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<sup>3</sup>Indicator variables for the presence of older children could be included as well. However, when indicator variables are included for the presence of children ages 5 through 14 and children 15 and older, the results are never significant.

coefficients on the indicator variables would approach one (or zero for the “None” category, as these women were not working prior to marriage), and the probability of working for newly married women estimated in Table 3 would simply reflect the expected probability that a newly married woman has a young child at home. This is not the case, however. Even when young children are not present, women in blue-collar occupations depart the labor force in large numbers when they get married. Close to 60% of women who were service workers before getting married leave the labor force immediately after their marriage, though another 13% depart when their first child is born. Similarly, 56% of production workers leave their jobs upon getting married, whether they have a young child at home or not. Therefore, a woman’s being newly married seems to have more of an effect on her labor force participation than the birth of her first child.

Table 6 shows coefficients of the same model estimated separately for each cohort. The effects of young children on labor force participation are not significantly different across cohorts for teachers and nurses, but for clerical workers, service workers, and production workers women in the youngest cohort are significantly more likely to work given the presence of young children than are women in older cohorts. For example, the participation rate of clerical workers born after 1955 who have children under 5 is not significantly different from the participation rate of those who do not, but clerical workers born between 1945 and 1955 are 12% less likely to participate in the labor force if they have young children. The participation rate for clerical workers born between 1945 and 1955 is still increasing with age, however, while that for clerical workers born prior to 1945 is decreasing.

The preceding result suggests that when clerical workers born before 1945 departed the labor force, they departed for good, but clerical workers born between 1945 and 1955 tended to depart for a few years and then return when their young children were older. By contrast, clerical workers born after 1955 tended not to depart at all. A similar pattern can be seen for service workers and production workers. The youngest service workers and production workers are less likely to leave the labor force upon getting married, return to the labor force more quickly if they do leave, and are less likely to stop working if they have a young child at home.

Comparing the time since marriage interactions in Table 6 with those in Table 4, the only significant differences in the coefficients are found for the middle cohort. They are all attenuated by between one quarter and one half of the coefficients calculated without the young child indicator variables. This suggests that the presence of young children only made a marginal difference in the time-participation profiles for women born between 1945 and 1955; before that, women tended to leave whether they had a young child or not. Similarly, women born after 1955 tended to return to the labor force whether or not they had a young child.

In summary, women with different occupations before marriage tend to participate differently in the labor force after they marry. In particular, women in more white-collar occupations, such as teachers, nurses, and clerical workers, were more likely to keep working than women in more blue-collar occupations, like service workers, production workers and farm laborers. Among blue-collar women,

women from younger cohorts tended to interrupt their employment for marriage and childbirth less than women from older cohorts; women from the youngest cohort often did not interrupt their employment at all. For women born between 1945 and 1955, up to one half of the increasing age-participation profiles that we observed seemed the result of a response to the presence of young children and a return to the labor force as women's children grow older. The presence of children did not seem to affect the time-participation profile of women born outside of these years, however.

The next section explores the contribution of the changing age composition and the changing distribution of initial occupations among women in the labor force to increases in Taiwan's female labor force participation rate.

## **4 Cohort-Specific Differences in the Distribution of Initial Occupations and the Aggregate Female Labor Force Participation Rate**

Since a woman's initial occupation affects her later work history, it is interesting to find out how cohort-specific differences in initial occupations may have affected the aggregate female labor force participation rate from 1979 through 1998. Table 7 shows, from the survey data, the distribution of women's initial occupations across the three cohorts. The differences are dramatic; of women born before 1945, 63.3% never worked before getting married, but for women born after 1955,

this figure drops to 21.1%. Moreover, the proportions of women who worked as clerical workers or production workers more than tripled. For women born before 1945, only 5.6% worked as clerical workers before getting married, but for women born after 1955, this figure rises to 18.6%; for production workers, the proportions are 11.7% and 35.2%. The proportion of women who were initially employed as sales or service workers also rose, from 6.6% for women born before 1945 to 11.6% for women born after 1955.

Since the age distribution of women in Taiwan for these years and the distribution of initial occupations by cohort are known, a modified version of the linear probability model from the preceding section can be used to estimate the aggregate female labor force participation rate. The modification is that, since the distribution of marriage durations for women in Taiwan by year is not available, age must be used as a proxy. The linear probability model then takes the form

$$\Pr(p = 1 \mid i) = \beta_{0C_i} \cdot O_i + \beta_{1C_i} \cdot A_i + \epsilon_i$$

where  $C_i$  is the woman's cohort,  $O_i$  is a vector of indicator variables for her initial occupation, and  $A_i$  is a vector of interaction terms between  $O_i$  and her age. The aggregate female labor force participation rate can then be predicted as

$$R = \sum_j \lambda_j \sum_k \alpha_k (C(j, t)) \widehat{\Pr}(p = 1 \mid C(j, t), O_k, A_j) \quad (2)$$

where  $j$  indexes ages,  $k$  indexes occupations,  $\lambda_j$  is the proportion of that age group within the population and  $\alpha_k$  is the proportion of that initial occupation within

that age.  $\alpha_k$  is a function of the cohort which is itself a function of the age  $j$  and time  $t$ .

Table 8 shows the predictions of (2) for the aggregate labor force participation rate. For comparative purposes, the first column is the direct estimate from Table 1 of the total labor force participation rate among married women of ages 20 through 50 from the Taiwanese labor force surveys, which increased by approximately 20%. The second column is a prediction of the same labor force participation rate calculated from (2). Given the distribution of women's ages and initial occupations in Taiwan for those years, the increase in the labor force participation rate predicted by the linear probability model, 23%, comes close to the estimate of the increase from the labor force surveys. The estimates are not expected to be identical because the questions asked by the surveys are somewhat different; the labor force surveys ask if the respondent worked in the past week, and the fertility surveys and Panel Study of Family Dynamics ask if the respondent was working "currently." They are similar enough, however, to show that (2) produces a reasonable estimate of the aggregate female labor force participation rate.

In order to find out the importance of changes in the labor force participation rate due to changes in age composition  $\lambda_j$ , the distribution of initial occupations by age  $\alpha_k$ , or changes in both, the portion of  $\Delta R$  attributable to changes in these

factors can be written as

$$\begin{aligned}\Delta R_\lambda &= \sum_j \left[ \sum_k \alpha_k(C(j,t)) \widehat{\Pr}(p=1 | C(j,t), O_k, A_j) \right] \Delta \lambda_j \\ \Delta R_\alpha &= \sum_k \left[ \sum_j \lambda_j \widehat{\Pr}(p=1 | C(j,t), O_k, A_j) \right] \Delta \alpha_k(C(j,t)) \\ \Delta R_{\lambda \cdot \alpha} &= \sum_j \sum_k \left[ \widehat{\Pr}(p=1 | C(j,t), O_k, A_j) \right] \Delta [\lambda_j \cdot \alpha_k(C(j,t))]\end{aligned}$$

Table 9 shows these quantities calculated for 1979 though 1985, 1992, and 1998.

Table 9 shows that the aging of the population in Taiwan – the mean age for married women ages 20 through 50 increased from 34 in 1979 to 37 in 1998 – did not make a significant contribution to the increase in the labor force participation rate by 1985, but contributed 1% by 1992 and 2.5% by 1998. The contribution of shifts in the distribution of women’s initial occupations was 2.2% in 1985, 4.9% by 1992 and 7.0% by 1998, or 30% of the total trend. Jointly, changes in the age distribution and changes in contributed 8.8% to the female labor force participation rate between 1979 and 1998, or 38% of the total trend observed.

## 5 Conclusion

This paper explores the relationship between women’s occupations before marriage and their subsequent participation in the labor force. Women in white-collar occupations are more likely to remain in the labor force than women in blue-collar occupations. Teachers were particularly likely to remain in the labor force, which may have been because of their eligibility for state benefits for government

employees. This is true for all three cohorts, though women in from younger cohorts have more of a tendency to remain in the labor force than do women from older cohorts in any occupation.

There are a number of reasons why women in white-collar occupations participate more in the labor force than do women in blue-collar occupations. One reason may simply be because the wages available to white-collar workers in the formal sector are higher. Another may be that women in white-collar occupations face fewer social barriers to returning to the labor force. For example, discrimination on the basis of marriage and childbirth may have affected female factory and service workers more than their white-collar counterparts (Chen 2000). Finally, women's presence in white-collar occupations may reflect improved educational opportunities, which would be expected to both make women more likely to participate in the labor force and more likely to take up white-collar work.

Women in occupations with a higher tendency to leave the labor force after marriage also have a higher probability of returning to the labor force as time passes. This can partly be explained by a variation in the response of women in different occupations to the presence of young children, particularly for women in blue-collar occupations born between 1945 and 1955. Women born prior to 1945 tended to leave the labor force permanently upon getting married, whether they had a child at home or not, and women born after 1955 tended to return to the labor force whether or not a young child was present. Also, teachers and clerical workers were much less likely than service workers, production workers or farm workers to stop working due to having a young child at home. This may

be because blue-collar occupations are less compatible with raising children than white-collar occupations, either because of work conditions or social norms. Or it may be that women who enter white-collar occupations have different ideas about raising children than women who do not.

This results in an occupation-specific probability of participation in the labor force throughout a woman's marriage. Due to persistence in women's occupations, changes in the distribution of initial occupations within cohorts will have long term implications for the aggregate female labor force participation rate. Women in younger cohorts were much more likely to have worked in either white-collar or blue-collar occupations before marriage than women in older cohorts. Factory work among women became fairly common, unlike the experience of some developing countries, and female labor force participation increased monotonically from 1979 to 1998. On the whole, changes in cohort-specific occupational structure explain about 30% of the observed increase.

There are two main issues raised in this paper. Firstly, this paper highlights the importance of occupational composition in understanding women's labor force participation. Secondly, this paper confirms that Goldin's (1995) U-shape in labor force participation over time is not inevitable. Because there were not any appreciable barriers to women taking up factory work – in fact, unmarried women were even preferred as factory workers – Taiwan experienced an increase in female labor force participation without an initial decrease as industrialization proceeded. This paper proposes more emphasis on occupational structure in analyses of female labor force participation.

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Table 1: Percent Labor Force Participation of Married Women and Occupational Composition of Employed Married Women Ages 20-50 in Taiwan Over Time

Occupation Category	Less than 40 hours			40 hours or more		
	1979	1985	1992	1979	1985	1992
Teachers	0.1	0.2	0.1	1.8	1.6	2.3
Nurses	0.0	0.0	0.0	0.3	0.4	0.8
Clerical Workers	0.1	0.2	0.2	3.2	4.2	8.0
Sales & Service Workers	1.5	1.6	1.0	7.2	10.8	13.8
Production Workers	2.0	2.0	1.6	6.5	12.3	12.7
Farm Workers & Laborers	3.2	2.3	1.0	8.1	7.6	5.2
Others	0.7	0.1	2.6	0.6	1.2	2.6
<b>Total Participation Rate</b>	7.0	6.3	4.1	27.8	38.1	45.3
Teachers	1.2	2.8	3.7	6.5	4.3	5.0
Nurses	0.2	0.5	0.6	1.0	1.0	1.8
Clerical Workers	1.6	2.5	5.0	11.6	11.0	17.6
Sales & Service Workers	21.7	24.7	24.5	25.9	28.3	30.4
Production Workers	28.7	31.8	39.3	23.6	32.2	28.0
Farm Workers & Laborers	46.2	36.8	24.8	29.1	20.0	11.5
Others	0.4	1.0	2.0	2.3	3.2	5.6
<b>Total</b>	100	100	100	100	100	100

Data are from the May supplements of Taiwan's Labor Force Surveys, collected by the Taiwanese Directorate-General of Budget, Accounting and Statistics.

Table 2: Percent Occupational Composition of Women Currently Working, by Occupation Before Marriage

Current Occupation	Occupation before Marriage		
	None	Teachers	Nurses
Teachers	0.6 (0.2)	84.3 (2.5)	4.5 (2.5)
Nurses	0.1 (0.1)	<b>0</b>	62.7 (5.9)
Clerical Workers	3.6 (0.5)	6.0 (1.6)	7.5 (3.2)
Sales & Service Workers	16.8 (1.0)	1.4 (0.8)	7.5 (3.2)
Production Workers	34.9 (1.2)	3.7 (1.3)	7.5 (3.2)
Farm Workers & Laborers	13.7 (0.9)	<b>0</b>	<b>0</b>
Others	30.2 (1.2)	4.6 (1.4)	10.5 (3.7)
		Sales & Service Workers	Production Workers
Teachers	2.5 (0.6)	0.9 (0.4)	0.2 (0.1)
Nurses	0.6 (0.3)	<b>0</b>	<b>0</b>
Clerical Workers	67.2 (1.8)	5.2 (1.0)	3.0 (0.5)
Sales & Service Workers	9.1 (1.1)	50.3 (2.3)	15.5 (1.1)
Production Workers	5.8 (0.1)	20.5 (1.9)	57.5 (1.5)
Farm Workers & Laborers	0.1 (0.1)	3.9 (0.9)	3.1 (0.5)
Others	14.7 (1.3)	19.2 (1.8)	20.6 (1.2)
	Farm Workers & Laborers	Others	
Teachers	0.7 (0.5)	0.7 (0.5)	
Nurses	<b>0</b>	0.7 (0.5)	
Clerical Workers	1.0 (0.6)	4.5 (1.2)	
Sales & Service Workers	11.9 (1.9)	11.8 (1.9)	
Production Workers	12.2 (1.9)	15.6 (2.1)	
Farm Workers & Laborers	61.6 (2.8)	3.1 (1.0)	
Others	12.6 (1.9)	63.5 (2.8)	

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Zeroes in bold indicate that no one in the sample went from that occupation before marriage to that occupation at the time of the survey. Standard errors are in parentheses. N = 4727.

Table 3: Linear Probability Model of the Effects of Time since Marriage and Occupation Before Marriage on the Probability of Employment in Any Occupation while Married (All Cohorts)

Occupation	Indicator Variable Coefficient	Time Since Marriage Interaction Coefficient
None	0.179 (0.005)	0.008 (0.001)
Teachers	0.779 (0.025)	-0.002 (0.002)
Nurses	0.514 (0.045)	0.013 (0.004)
Clerical Workers	0.546 (0.014)	0.004 (0.001)
Sales & Service Workers	0.317 (0.014)	0.012 (0.001)
Production Workers	0.356 (0.009)	0.011 (0.001)
Farm Workers & Laborers	0.450 (0.026)	0.008 (0.002)
Others	0.418 (0.021)	0.008 (0.002)

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Standard errors are in parentheses. N=22,546.

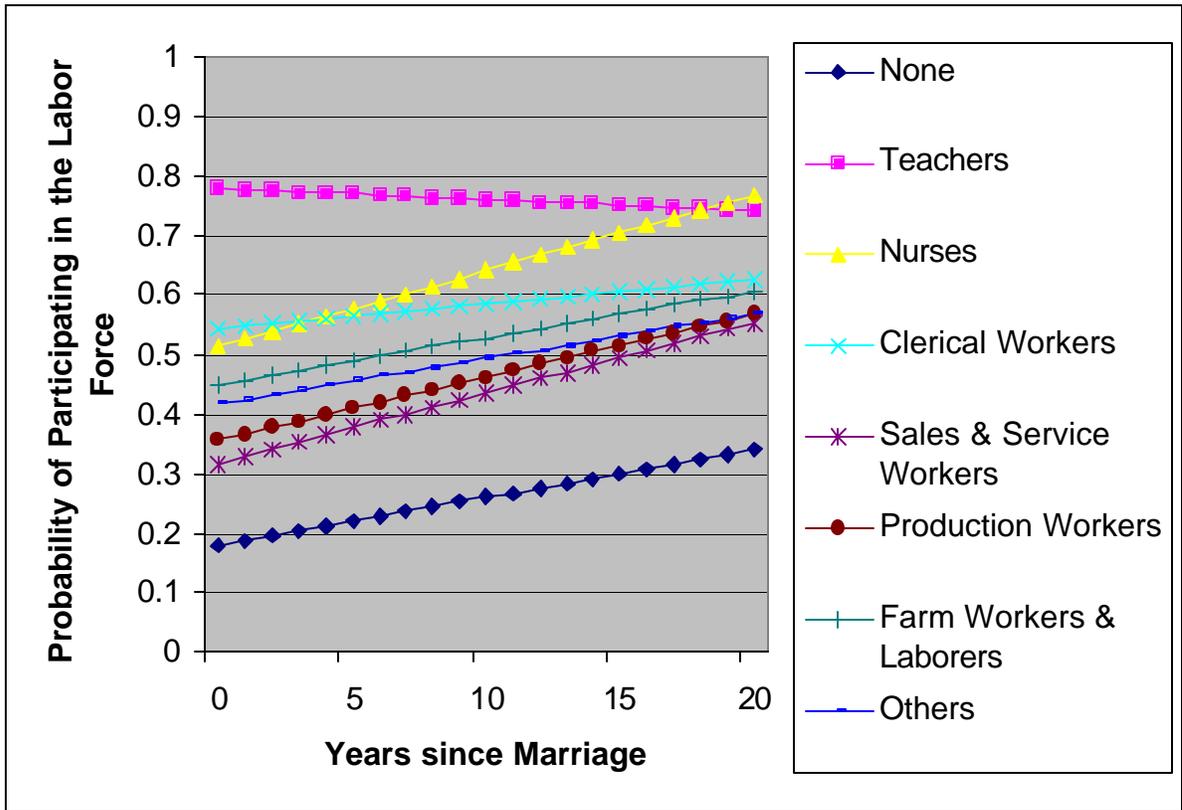


Figure 1: Predicted Probability of Women's Participation in the Labor Force, by Initial Occupation and Time since Marriage

Table 4: Linear Probability Model of the Effects of Time since Marriage and Occupation Before Marriage on the Probability of Employment in Any Occupation while Married, By Cohort

Occupation	Indicator Variable	Time Since Marriage Interaction
<i>Born Prior to 1945</i> (N=8769)	Coefficient	Coefficient
None	0.204 (0.007)	0.003 (0.001)
Teachers	0.748 (0.045)	-0.002 (0.004)
Nurses	0.445 (0.103)	0.014 (0.008)
Clerical Workers	0.480 (0.032)	-0.001 (0.003)
Sales & Service Workers	0.212 (0.024)	0.009 (0.002)
Production Workers	0.241 (0.019)	0.008 (0.002)
Farm Workers & Laborers	0.393 (0.039)	0.007 (0.002)
Others	0.335 (0.040)	0.005 (0.003)
<i>Born 1945-1955</i> (N=9386)		
None	0.135 (0.007)	0.018 (0.001)
Teachers	0.819 (0.036)	-0.003 (0.003)
Nurses	0.549 (0.073)	0.011 (0.007)
Clerical Workers	0.528 (0.021)	0.006 (0.002)
Sales & Service Workers	0.276 (0.020)	0.016 (0.002)
Production Workers	0.310 (0.013)	0.015 (0.001)
Farm Workers & Laborers	0.486 (0.036)	0.009 (0.003)
Others	0.335 (0.031)	0.011 (0.003)
<i>Born After 1955</i> (N=4391)		
None	0.186 (0.116)	0.017 (0.003)
Teachers	0.751 (0.057)	0.002 (0.007)
Nurses	0.510 (0.069)	0.014 (0.007)
Clerical Workers	0.587 (0.023)	0.011 (0.002)
Sales & Service Workers	0.476 (0.030)	0.016 (0.003)
Production Workers	0.479 (0.017)	0.009 (0.002)
Farm Workers & Laborers	0.592 (0.105)	-0.001 (0.007)
Others	0.565 (0.037)	0.010 (0.003)

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Standard errors are in parentheses.

Table 5: Linear Probability Model of the Effects of Time Since Marriage, Occupation Before Marriage and the Presence of Young Children on the Probability of Employment in Any Occupation while Married (All Cohorts)

Occupation	Indicator Variable Coefficient	Time Since Marriage Interaction Coefficient	Young Child Coefficient
None	0.204 (0.006)	0.007 (0.001)	-0.039 (0.008)
Teachers	0.803 (0.032)	-0.003 (0.002)	-0.044 (0.046)
Nurses	0.629 (0.066)	0.009 (0.004)	-0.166 (0.075)
Clerical Workers	0.588 (0.020)	0.003 (0.001)	-0.067 (0.024)
Sales & Service Workers	0.404 (0.021)	0.009 (0.001)	-0.134 (0.025)
Production Workers	0.438 (0.014)	0.008 (0.001)	-0.125 (0.016)
Farm Workers & Laborers	0.510 (0.032)	0.006 (0.002)	-0.146 (0.044)
Others	0.517 (0.029)	0.004 (0.002)	-0.157 (0.036)

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Standard errors are in parentheses. N=22,546.

Table 6: Linear Probability Model of the Effects of Time Since Marriage, Occupation Before Marriage and the Presence of Young Children on the Probability of Employment in Any Occupation while Married, By Cohort

Occupation	Indicator Variable	Time Since Marriage Interaction	Young Child
	Coefficient	Coefficient	Coefficient
<i>Born Prior to 1945 (N=8769)</i>			
None	0.214 (0.009)	0.003 (0.001)	-0.017 (0.011)
Teachers	0.772 (0.058)	-0.003 (0.004)	-0.045 (0.081)
Nurses	0.456 (0.152)	0.014 (0.009)	-0.016 (0.163)
Clerical Workers	0.503 (0.043)	-0.001 (0.003)	-0.038 (0.054)
Sales & Service Workers	0.272 (0.032)	0.007 (0.002)	-0.110 (0.040)
Production Workers	0.358 (0.029)	0.005 (0.002)	-0.175 (0.032)
Farm Workers & Laborers	0.398 (0.047)	0.007 (0.003)	-0.013 (0.065)
Others	0.458 (0.053)	0.003 (0.003)	-0.202 (0.061)
<i>Born 1945-1955 (N=9386)</i>			
None	0.147 (0.009)	0.018 (0.001)	-0.016 (0.011)
Teachers	0.815 (0.044)	-0.002 (0.003)	0.009 (0.065)
Nurses	0.678 (0.106)	0.008 (0.007)	-0.182 (0.120)
Clerical Workers	0.603 (0.029)	0.003 (0.002)	-0.120 (0.036)
Sales & Service Workers	0.425 (0.031)	0.010 (0.002)	-0.212 (0.035)
Production Workers	0.406 (0.019)	0.012 (0.001)	-0.150 (0.023)
Farm Workers & Laborers	0.604 (0.044)	0.005 (0.003)	-0.291 (0.058)
Others	0.472 (0.047)	0.006 (0.003)	-0.214 (0.055)
<i>Born After 1955 (N=4391)</i>			
None	0.318 (0.030)	0.014 (0.003)	-0.193 (0.030)
Teachers	0.825 (0.067)	-0.002 (0.006)	-0.121 (0.091)
Nurses	0.660 (0.095)	0.009 (0.007)	-0.222 (0.115)
Clerical Workers	0.611 (0.034)	0.010 (0.002)	-0.035 (0.040)
Sales & Service Workers	0.508 (0.044)	0.015 (0.003)	-0.048 (0.052)
Production Workers	0.511 (0.025)	0.008 (0.002)	-0.048 (0.030)
Farm Workers & Laborers	0.595 (0.118)	-0.001 (0.007)	-0.009 (0.211)
Others	0.586 (0.050)	0.009 (0.004)	-0.032 (0.064)

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Standard errors are in parentheses.

Table 7: Percent Distribution of Women’s Initial Occupations, By Cohort

Initial Occupation	Year of Birth		
	Prior to 1945	1945-1955	After 1955
None	63.3 (0.7)	43.2 (0.7)	21.1 (0.9)
Teachers	2.2 (0.2)	2.6 (0.2)	2.3 (0.3)
Nurses	0.5 (0.1)	1.0 (0.1)	1.9 (0.3)
Clerical Workers	5.6 (0.3)	10.9 (0.4)	18.6 (0.8)
Sales & Service Workers	6.6 (0.4)	9.9 (0.4)	11.6 (0.7)
Production Workers	11.7 (0.5)	23.4 (0.6)	35.2 (1.0)
Farm Workers & Laborers	6.5 (0.4)	4.3 (0.3)	1.3 (0.2)
Others	3.6 (0.3)	4.7 (0.3)	7.9 (0.6)

Data are from the Taiwanese KAP-IV and KAP-VI fertility surveys and the Taiwanese Panel Study of Family Dynamics. Standard errors are in parentheses. N=12,368.

Table 8: Percent Labor Force Participation Rate of Married Women Ages 20 through 50 in Taiwan, Calculated From the Taiwanese Labor Force Surveys and the Merged Fertility Survey and Panel Survey Data Set

	Labor Force Survey Data	Fertility & Panel Survey Data
1979	34.7 (0.5)	35.3 (0.4)
1985	44.4 (0.5)	42.7 (0.4)
1992	49.4 (0.5)	52.0 (0.6)
1998	54.5 (0.5)	58.5 (0.9)

Standard errors are in parentheses.

Table 9: Decomposition of Changes in Percent Labor Force Participation Rates, due to Age, Occupational Composition, and Joint Age-Occupational Composition

	I ( $\Delta R$ )	II ( $\Delta R_\lambda$ )	III ( $\Delta R_\alpha$ )	IV ( $\Delta R_{\lambda\alpha}$ )
1985	7.3 (0.2)	0.0 (0.1)	2.2 (0.2)	2.3 (0.4)
1992	16.6 (0.5)	1.0 (0.1)	4.9 (0.8)	5.6 (0.4)
1998	23.1 (0.9)	2.5 (0.2)	7.0 (1.4)	8.8 (0.7)

Standard errors are in parentheses. All changes are relative to 1979. Column I is the total change in the labor force participation rate. Columns II, III and IV are imputed differences in participation due to changes in the relative proportion of age cells (II), occupation cells (III), and age-occupation cells (IV).