

Outsourcing Household Production: The Demand for Foreign Domestic Workers and Native Labor Supply in Hong Kong*

Patricia Cortés[†]

Jessica Y. Pan[‡]

March, 2010

Abstract

Migration of women as domestic workers from developing to developed countries is a growing phenomenon. In Hong Kong, foreign domestic workers (FDWs) account for 6 percent of the labor force and among households with young children, more than one in three households hire at least one. This paper explores how the widespread availability of FDWs in Hong Kong affected native women's labor supply decisions and welfare. Our empirical strategy is based on two complementary approaches. First, exploiting differences in the expansion of the FDW program between Hong Kong and Taiwan from 1978 to 2006, we find that the program is associated with a 9 to 13 percentage point increase in employment of mothers with a young child, compared to mothers with older children. Second, using cross-sectional variation in the cost of hiring a FDW, we estimate a structural model of labor force participation and the decision to hire a FDW. We find evidence of strong complementarities between the two choices, particularly for mothers with very young children, suggesting that FDWs are a good substitute for mother's time in household production. From simulation exercises, we estimate that the availability of FDWs at current prices generates a monthly average consumer surplus for mothers of young children aged 0 to 5 of between US\$130 to \$200, and has increased their labor force participation rate by 12 to 13 percentage points relative to mothers of older children. In spite of the use of different sources of variation, the simulated program estimates from the structural model and the difference-in-difference estimates are remarkably similar.

*We are grateful to David Autor, Marianne Bertrand, David Card, Matthew Gentzkow, Chris Hansen, Divya Mathur, Jesse Shapiro, Wing Suen, and seminar participants at the University of Hong Kong, Booth School of Business, SOLE, Princeton, Atlanta Fed, UC Berkeley, Boston College, Boston University SGM, Dartmouth and at the NBER Summer Institute for numerous helpful comments and suggestions. We are also grateful to the Hong Kong Census and Statistics Department for providing the data and their invaluable assistance.

[†]University of Chicago, Booth School of Business. Email: pcortes@chicagobooth.edu

[‡]University of Chicago, Booth School of Business. Email: jpan3@chicagobooth.edu

1 Introduction

In the past decade, there has been a surge in the number of low-skilled female workers from developing countries such as the Philippines, Indonesia, Thailand, and Sri Lanka migrating to the “new” rich countries as domestic helpers. In Singapore, by 2000, there were approximately 100,000 migrant domestic helpers in the workforce, amounting to one foreign maid in eight households (Yeoh et al, 1999). In Hong Kong, the proportion of households hiring at least one foreign domestic worker (FDW) increased from less than 2% in 1986 to close to 8% in 2006. Among households with young children, more than one in three hired at least one FDW.

The economic implications of the temporary migration of private household workers can differ substantially from that of conventional low-skilled migrants. First, since these temporary domestic helpers generally substitute for household production, they potentially influence the time-use decisions of women, particularly the highly skilled (Kremer and Watt, 2006). Second, given that domestic workers provide relatively inexpensive childcare, they may also affect the fertility decisions of natives. This is particularly relevant as Hong Kong has one of the lowest fertility rates in the world. Finally, we would not expect foreign domestic workers to have a large effect on the labor market outcomes of natives of similar skill level, given that they are not allowed to work in any other occupation.¹

This paper’s goal is to investigate the effects of the availability of FDWs on Hong Kong women’s labor supply decisions and the welfare consequences. Future work will address the impact of FDWs on fertility. Our research agenda aims to expand the understanding of women’s preferences for work and children, and our analysis may also have a number of implications for immigration policies. This form of migration has become increasingly prevalent in some developed countries as a result of demographic changes and increasing demand for household services as women seek to enter the labor market. For example, Canada has a Foreign Live-in Caregiver Program and Israel has a special visa program for foreign caregivers. In recent years, guest worker programs have also been discussed as part of immigration reform in the United States.²

Our empirical strategy is based on two complementary approaches - the macro approach exploits variation at the country-year level in the relative wage of a FDW, while the micro approach exploits cross-sectional variation at the individual level in the cost of hiring a FDW. Given that neither approach constitutes an ideal natural experiment, the comparison of the estimates from the two approaches provides a strong test of the robustness and validity of our results.

¹Another economic implication, suggested in Kremer and Watt (2006) is that by allowing high-skilled native women to increase market labor supply, this type of immigration increases the wages of low-skilled natives and provides a fiscal benefit by correcting tax distortions toward home production.

²For example, in 2006, Senator Arlen Specter introduced a bill to create a Guest Program, where workers would not have the right to become permanent residents or citizens.

The macro approach utilizes time-series variation in the expansion of the program and the relative price of hiring a foreign domestic worker. Our period of analysis, 1978 to 2006, coincides with a period of rapid economic growth in Hong Kong. Thus, our main empirical challenge is to separately identify the effect of the availability of foreign domestic workers from effects arising from changes in the wage distribution, unearned income, etc. To do so, we exploit variation in the expansion of the FDW program in Hong Kong and Taiwan as well as differences in the demand for household services by households with relatively younger or older children to form difference-in-difference estimates of the impact of the FDW program on female employment rates.

Looking at trends in economic and demographic outcomes as well as comparing the structure of childcare markets in both countries, we provide evidence that suggests that Taiwan is a reasonable control group. Our difference-in-difference estimates indicate that, on the aggregate, the foreign worker program in Hong Kong is associated with a 9 to 13 percentage point increase in employment of females with a young child, compared to females with a relatively older child from 1978 to 2006. Consistent with the view that natives with a higher opportunity cost of time are more likely to purchase such domestic services and supply more labor, we find that this increase is almost entirely driven by the increase in employment rates of middle and highly skilled females.

The micro approach utilizes pooled cross-sectional data from the 2001 and 2006 Hong Kong population census to estimate a model of female labor supply, where the decision to participate in the labor force and the decision to hire a FDW are modeled jointly. One advantage of the structural model is that because the model is derived from utility maximization, the estimates can be interpreted as structural determinants of the demand for outsourcing household production. In particular, we can estimate the degree of complementarity between the two decisions and thus infer the extent to which foreign domestic helpers substitute for native women's time spent in household production. Finally, we can also use the estimated parameters to calculate welfare effects of the availability of FDWs and simulate counterfactual labor supply decisions in the absence of the program.

We use a multinomial probit model to study how women choose between the four possible labor force participation-FDW states. To separately identify the degree of complementarity between the two decisions from correlation in unobservables, we propose using the number of rooms in a house as an instrument. We argue that the number of rooms affects the utility derived from hiring a FDW but does not directly affect the utility from participating in the labor force. This exclusion restriction is motivated by the fact that most Hong Kong households are relatively space constrained and that conditional on household wealth, the number of rooms should be uncorrelated to a woman's unobserved propensity to work. We address concerns about the validity of the exclusion restriction by performing placebo tests on the reduced form of the effect of number of rooms on the labor force participation decisions of unmarried women and married women with no children. We also address the potential endogeneity of the number of rooms by considering a

sample of households who reside in government subsidized sale flats, where they face important choice and moving restrictions. Finally, as suggestive evidence that the validity of the instrument is not compromised by households moving into houses with a larger number of rooms when they wish to hire a domestic helper, we study whether households that have moved in the last five years are more likely to hire a FDW. We also present results restricting the sample to households that have not moved in the last five years.

We find strong complementarity between the labor force participation and the decision to hire a FDW: reductions in the relative wage of FDWs significantly increase the probability that a woman decides to join the labor force. This complementarity is especially strong for mothers of very young children implying a significant degree of substitution between the mother's time and the domestic worker's time in caring for the child. For educated women who choose to work, hiring a FDW increases their utility more than that for women in other groups. One possible reason could be that highly educated women work in occupations that value flexibility and hiring a FDW increases their return to working.

Our welfare estimates indicate that mothers of very young children, women with high education level and women with high unearned income have benefited most from the availability of FDWs. The average monthly consumer surplus for the whole population of mothers aged 25 to 44 is between 550 and 850 HKD (70 to 110 US\$), and between 1000 to 1500 HKD for mothers of young children. The average consumer surplus for mothers with a high education level is more than double that for mothers with a medium education level, and more than ten times larger than that for low educated mothers. To check that our magnitudes are reasonable, we compare the differential willingness to pay between two women identical in all observable and unobservable characteristics but in the age of the youngest child to the difference between the minimum wage of a FDW and the wage of a native unskilled worker, and they are roughly similar.

To compare the estimates from our micro and macro approaches, we use the structural estimates to simulate the optimal labor supply decisions of women assuming that they faced the 1981 relative cost of hiring a FDW instead of the 2001 relative cost. For ease of comparison with the macro difference-in-difference estimates, we perform the simulation separately for women with a younger or older child. The simulated micro difference-in-difference estimate of the effect of the FDW program on female force participation is between 12 to 13 percentage points. The similarity between the macro and micro estimates is remarkable given their use of different sources of variation, and suggests that our estimates of the effect of the FDW program on female labor supply are robust and reliable.

These findings also have important implications for understanding the sources of persistent gender differences in employment and for policies that seek to encourage female participation in the labor force. That we find large female labor supply responses as a result of the decrease in relative

costs of hiring a foreign domestic helper suggests that at least part of the gender difference in labor market outcomes can be attributed to the lack of affordable and flexible childcare. This finding is in line with studies that have demonstrated that maternal labor supply is sensitive to the availability and price of childcare.³ Our paper differs from these papers in two important ways. First, the magnitude of the decline in prices generated by the expansion of the FDW program is much larger than of previous studies. Second, a foreign domestic helper provides full-time, live-in help and represents one of the most complete forms of outsourcing household production.⁴ Hence, one might expect to see much larger labor supply responses in this setting. Finally, this paper suggests that an immigration policy that permits temporary foreign domestic workers can have important policy implications for encouraging skilled women to enter the labor market and to bridge the gender gap.

Despite the prevalence of these programs in many countries, there are few empirical studies of the labor market implications of the influx of temporary low-skilled migrant domestic workers to developed countries. A recent paper by Cortes and Tessada (2009) documents that the decrease in prices of domestic services, as a result of the growth in low-skilled immigrants, has a relatively large impact on the time-use of highly-skilled American women. To our knowledge, only two papers have studied similar questions in the Hong Kong context. Suen (1993) and Chan (2006) both provide some evidence that hiring a live-in domestic worker is associated with a higher likelihood of female labor force participation, but neither addresses causality concerns.

The rest of the paper proceeds as follows. The next section describes the foreign domestic worker program in Hong Kong and the data. The time-series cross-country analysis is presented in Section 3. Section 4 develops and estimates the structural model using cross-sectional data and Section 5 concludes.

2 Background and Data Description

2.1 Foreign Domestic Helper Policy in Hong Kong

The foreign domestic helper program was first introduced in Hong Kong in the early 1980s. Compared to other receiving countries, Hong Kong has a relatively liberal policy toward these foreign workers.⁵ The government does not impose a quota on the number of foreign domestic helpers

³For example, Blau and Robins (1988), Connelly (1992), Gelbach (2002), and Baker et al (2008).

⁴Other forms of childcare arrangements such as daycare centers and preschool offer much less flexibility than a live-in domestic helper. They tend to be closed on holidays, send sick children home and are only open for limited hours. Moreover, daycare centers do not perform other domestic tasks like cooking and cleaning (Kremer and Watt, 2006).

⁵Women from mainland China are not eligible to enter Hong Kong as FDWs. This is due to administrative difficulties in monitoring as mainland Chinese are indistinguishable from locals and concerns that Hong Kong residents

in Hong Kong and employers are free to hire these workers so long as they fulfill the requisite conditions set out in the standard contract. The main restrictions are that the FDW has to work and reside in the employer's residence and that households have to meet an income criteria in order to hire a foreign maid. In 2008, this was set at the median household income (HKD\$15,000) or the equivalent in assets. These workers are entitled to a minimum wage and are protected under the Employment Ordinance and the Standard Contract for the Employment of a Foreign Domestic Helper. Figure 1 shows the evolution of the minimum wage for FDWs (there is no minimum wage for natives) and the median wage for full time employees.⁶ As observed, the relative price of FDWs decreased monotonically until 2001. Since then it has stayed relatively stable, with a slight increase from 2000 to 2005. Figure 2 shows the evolution of the relative wage of native women to the minimum wage for FDWs separately by the education level of native women.

To provide a sense of how rapidly this program has expanded, Figure 3 presents the number FDWs in Hong Kong from 1981 to 2006 as a proportion of domestic households, by the education level of the female household head or spouse of household head and by the presence of children of different ages.⁷ We consider three types of women: those with youngest child aged 0 to 5, 6 to 17 and those with no children. Several observations are worth mentioning. First, although women at the top education level are most likely to hire FDWs, the share hiring at least one FDW has stayed relatively constant since the mid 1990s. Interestingly, women with a medium level of education had the most continuous growth in demand for FDWs over time. For unskilled women the share hiring FDWs have increased, but continue to be significantly smaller than that of the other two groups. Second, the demand for domestic help comes almost exclusively from households with children. This is true even among highly skilled women. This might be explained by a number of factors such as the cost in terms of privacy loss of having a non-family member living in the house and the high cost of space in Hong Kong.

A couple of statistics show the amount of substitution of household work that takes place in households that decide to hire a FDW. In the time-use supplement of the 2001 General Household Survey, 35 percent of FDWs report doing 100 percent of the household work, and at least 70 percent report doing more than 70 percent of the household work. By law, FDWs are only allowed one free day a week - this explains why 80 percent of FDWs report working more than 50 hours a week.

Most of the foreign workers are drawn from the Philippines, Indonesia, and Thailand. Table 1 shows the evolution of the share of households with a domestic worker, by the domestic worker's

will bring in their family members from the Mainland on the pretext of hiring them as domestic helpers (Chiu, 2004).

⁶The minimum wage is binding. For example, based on the 2001 Census, 45 percent of households with a FDW paid exactly the minimum wage (HK\$3670) and the average was only slightly higher, HK\$3757.

⁷We define low education as having at most primary education, medium education as having more than a primary education but less than a college degree, and high education as having a college degree or a graduate degree. This classification applies to both Hong Kong and Taiwan.

nationality. In the 1970s almost all of the domestic workers were mainland Chinese who worked for upper class families. Their advanced average age suggests that there was practically no replacement for them within the native labor supply. By 1981, some Filipinas entered the market, lowering the average age and increasing the education levels of domestic helpers. By the early 1990s, the FDW market was dominated by Filipinas, but their market share started eroding toward the end of the 1990s as lower-cost Indonesian maids entered the domestic helper market. By 2006, there were roughly equal numbers of Filipinas and Indonesians working in Hong Kong as domestic helpers. As observed, FDWs tend not to be drawn from the lower tail of the education distribution of their home countries. Filipinas, in particular, are very educated; 20% of them have completed a college degree, compared to 12% of Hong Kong-ers and a mere 3% of Indonesians. Most Filipinas also speak English. Indonesians, in contrast, compensate for their lack of English speaking abilities by learning the local language, with close to 90% of Indonesians reporting an ability to speak Cantonese.

In sum, the FDW program in Hong Kong has provided native women with a relatively inexpensive and reliable source of housekeeping and childcare services.

2.2 Data Description

We use the 5% sample data from the 1996 to 2006 Hong Kong Population census and by-census and the 1% sample data from 1976 to 1991. We will also make use of the General Household Survey (GHS) from 1985 to 2007. The Hong Kong population census and by-census are conducted every five years while the GHS is conducted quarterly. Both data sets provide a range of demographic information on all members of an enumerated household. The presence of live-in foreign domestic maids in a household is inferred from a variable that indicates whether the relation of the respondent to the household head is that of a live-in foreign domestic helper, chauffeur or gardener and the nationality of the respondent. While it is very likely that almost all workers in this category are foreign domestic helpers, to ensure that this is the case, we only include the female workers in this category. Our source of Taiwanese data is from the the Taiwan Manpower Utilization Survey (MUS) which is a household survey conducted yearly since 1978 by Taiwan's Directorate-General of Budget, Accounting, and Statistics (DGBAS). It provides labor force information for a representative sample of about 60,000 individuals over the age of 15. The sample covers the civilian population in Taiwan and excludes foreign workers who do not have citizenship.

3 Macro Approach: Hong Kong vs. Taiwan

As shown in Figure 1, there has been substantial time-series variation in the relative price of hiring a domestic worker in Hong Kong during the past couple of decades. The idea of our macro approach is to use this variation to estimate the effect that the foreign domestic worker program has had on aggregate female labor supply in Hong Kong.

To motivate the empirical strategy, we begin by setting up a very simple aggregate demand and supply model of domestic workers and consider the likely effects of the FDW program on this market and the labor market. This set-up will highlight some of the empirical challenges faced in trying to estimate the effect of the FDW program on female labor supply. We then suggest how using a comparison with Taiwan can address some of these empirical concerns and provide some evidence that Taiwan is a reasonable control group. Finally, we present our difference-in-difference estimates of the effect of the FDW program on the labor supply of women in Hong Kong.

3.1 The Market for Domestic Workers

Figure 4a illustrates the structure of aggregate demand and supply for domestic help in the economy. Aggregate demand depends on the potential wage, unearned income, and family composition distribution for women in the economy. As the wage distribution of women shifts to the right and as families become richer, the demand for domestic workers will also shift to the right.

We assume that prior to the introduction of the FDW program the aggregate supply of domestic workers is upward sloping; native women will be willing to work as domestic workers if the pay is good enough. The introduction of the FDW program in Hong Kong results in a perfectly elastic supply of domestic workers at the minimum wage determined by the government. The minimum wage is usually high enough compared to the wage opportunities in sending countries that we can assume an almost unlimited supply of foreign domestic workers at the prevailing minimum wage.

The introduction of the program, *ceteris paribus*, should have increased the number of domestic workers. As we will discuss in the model presented in the next section, the program should also increase the labor force participation of women who hired a domestic worker (with the exception of those with very high unearned income).

3.1.1 Estimating the Effect of the FDW Program on Female Labor Supply

Hong Kong experienced rapid economic growth during the period when the foreign domestic worker program was established. This resulted in large increases in women's wages and unearned income. Therefore, changes in the observed quantities of domestic workers and in the labor force participa-

tion of women cannot be fully attributed to the creation of the program as shifts in demand are likely to be very important too. Figure 4a presents the empirical challenge. Before the introduction of the program, the market was at equilibrium at point a . After the introduction of the program (and high rates of economic growth), the market is at equilibrium point c . Clearly, comparing points a and c would not allow us to discern whether the increase in the share of women hiring domestic workers was a result of the supply shift due to the FDW program or concurrent increases in the demand for domestic workers due to the rightward shift in the wage distribution of women over the same time period. Moreover, as the economy grows, this may affect the supply of domestic workers, even in the absence of the FDW program.

Ideally, we would like to estimate point b in the figure, which represents the equilibrium supply of domestic workers which would have resulted in the absence of the FDW program over the same time period. In Figure 4a, we assumed that the supply curve of domestic workers in the absence of the program shifts slightly to the left due to increase in wealth and in wages in alternative occupations, although under a different set of assumptions, the supply curve could have shifted to the right. Using Taiwan, a country that experienced a remarkably similar growth path to Hong Kong would potentially allow us to estimate the effect of the FDW program on the supply of domestic workers in Hong Kong ($c-b$).

Since we lack data on the number of domestic helpers in Taiwan, we do not estimate the actual first-stage effect of the FDW program on the supply of domestic workers to Hong Kong. Instead, we estimate the reduced form effect of the FDW program on the labor supply of women. Based on the model presented in the next section, the increase in supply of domestic workers should increase the LFP of women who are now able to hire a domestic helper (with the exception of those with high unearned income). The effects of the FDW program on the market for native workers is illustrated in Figure 4b. Similar to Figure 4a, the empirical challenge is to separate out the supply shift due to the program from the supply (and demand) shifts that occurred in the absence of the program. More specifically, assume that the labor market was initially in equilibrium at point A at time t . At time $t + 10$, a combination of demand shocks, likely due to a secular increase in demand for female labor and supply shocks due either to the program or greater willingness of women to enter the labor market, results in an equilibrium at point C. We are interested in the equilibrium at point B, which represents the equilibrium in the absence of the FDW program. We will make use of Taiwan as a control group to estimate point B and the program effect, C-B.

3.2 Taiwan as a Control Group

Hong Kong is a relatively small country and the policy was implemented at a national level, hence we cannot exploit geographical variation within Hong Kong. Looking outside Hong Kong, however,

suggests that we can use Taiwan as a possible control group given the close proximity as well as economic and cultural similarity of the two countries.

3.2.1 Economic and Demographic Trends: Hong Kong vs. Taiwan

As first evidence that Taiwan is a reasonable control group for Hong Kong we show that the two countries experienced very similar trends in the main observed determinants of the labor supply for women. Figure 5 depicts the predicted labor force participation of mothers in Taiwan and Hong Kong from a cross-sectional model using as explanatory variables, age dummies, education dummies, husband's income percentile dummies, dummy for youngest child aged 0 to 5, and a dummy for Hong Kong. The model is estimated using all available years. As observed, the evolution of LFP due solely to compositional changes in the explanatory variables is remarkably similar across the two countries. Basic descriptive statistics of demographic and economic variables are presented in Appendix Table A1. Generally speaking, the levels of most variables are remarkably similar across Taiwan and Hong Kong, considering that the two are different countries.⁸

3.2.2 The Childcare Market in Taiwan and Hong Kong

In this section we provide a brief discussion of the structure of childcare in each country. We also present some suggestive evidence that the demand and supply of childcare services have followed similar trends in both countries.

Cultural Similarities and the Role of Grandparents

Hong Kong and Taiwan share very similar cultural heritage and family values. In both countries, most people aged 60 and above live with one of their offspring, usually their eldest son. The extended family system traditionally provides for many of the needs of family members, including childcare. Appendix Table A2 shows how the probability that a married woman lives with her mother or mother-in-law has evolved in the past decades in the two countries. Two observations are worth noting. First, although in both countries the share of married woman living with the extended family is very high by Western standards, it is consistently larger in Taiwan. A likely explanation for this difference is space constraints in Hong Kong. Most apartments in the city-state are very small. Note, however, that it is still very common for the parents to live very close to their adult children and to be very much involved in childcare. Most important for our empirical

⁸The sample used in this section consists of married mothers aged 25 to 44 who have at least one child aged 0 to 17.

exercise is the observation that for both countries, net of age dummies, the probability of living with a mother or mother-in-law has stayed high and relatively constant for the past couple of decades.

Market provision of childcare

Nurseries for children younger than three are not very widespread in both countries. In Taiwan, the lack of FDWs has not been compensated by a larger supply of nurseries or childcare centers. Appendix Table A3 shows that less than 0.5 percent of Taiwanese children aged 0 to 3 went to day care; most of them were taken care by parents or grandparents (91 percent) or by nannies (7.5 percent in 2006). In Hong Kong, 50 percent of working mothers of young children (0 to 4 years of age) relied on foreign domestic helpers as the major care provider, while only 30.6 percent had a family member or relative look after their children (Henshall, 1999).

Shifts in the demand for childcare

As in many other countries, higher returns to education and the increase in the price of women's skills have generated a substantial increase in the labor force participation of married women and mothers in Hong Kong and Taiwan. Figure 6 presents the evolution of the average wage and the 10th percentile wage (in constant local units) for women in Hong Kong and Taiwan, and for Hong Kong, the minimum wage for FDWs. Its purpose is three-fold. First, to show that average female wage has followed remarkably similar paths in the two countries. Second, assuming that maids and nannies are drawn from the bottom of the wage distribution, so have the prices of outsourcing household production in the absence of FDWs. Third, that the presence of FDWs has significantly reduced the relative price of outsourcing household production in Hong Kong as compared to Taiwan.

It is worth pointing out that while Taiwan does have a foreign domestic helper program, the magnitude and scope of the program are far smaller than that of Hong Kong's. In 2001, FDWs comprised approximately 1.1% of the labor force in Taiwan compared to 5.3% in Hong Kong. This is reflected in Appendix Table A3 - less than 0.4 percent of children aged 0 to 3 were taken care of by FDWs in Taiwan. There are two main programs through which foreign nationals can work as domestic helpers in Taiwanese households - the foreign domestic helper scheme and the foreign caretaker scheme. The official foreign domestic helper scheme began in 1992, and at its peak in 1996, accounted for approximately 13,000 foreign workers. This program has since been scaled down and only permits special applications for foreign investors and families requiring special child or elderly care. The bulk of foreign domestic workers to Taiwan have since entered under the foreign caretaker scheme. This scheme, however, requires applicants to demonstrate that the person under their care has a medical condition that requires 24 hours care⁹. This is in sharp contrast to the

⁹Note that it is common for households to forge medical documents in order to hire a foreign caretaker to perform

program in Hong Kong, where household income is the only eligibility requirement.

3.3 Difference-in-Difference Estimator

We will exploit differences in the ease of engaging a foreign domestic helper between Hong Kong and Taiwan as well as differences in the demand for household services by child age structure to examine the impact of foreign domestic helper policies on female labor force participation rates. The cross-country comparison allows us to use Taiwan as a control group to difference out group-specific trends in employment, while the comparison of females with older (youngest child aged 6 to 17) versus females with younger children (youngest child aged 0 to 5) allows us to difference out country-specific trends in female labor force participation over the time-period that affect women in both groups. As one might expect the female labor force participation rates of females with an older child and a younger child to change differentially across time, even within a country, we will compare differences in the growth rates of employment across the groups. We interpret the difference in the growth of female LFP of these two groups, adjusting for composition changes, as providing a measure of the impact of the foreign worker policy on LFP rates in Hong Kong.

Figure 7 provides graphical evidence that the trends in labor force participation of females with a younger child aged 0 to 5 and females with a relatively older child aged between 6 to 17 has evolved quite differently across the two countries starting in the late 1980s. In particular, while the change in employment of females with younger and older children was relatively similar prior to 1981 in both countries, labor force participation rates of women with younger children in Hong Kong accelerated starting in the late 1980s, such that by 2006, it actually exceeded that of women with older children. This is in stark contrast to Taiwan, where the growth in employment rates across the two groups of women remained virtually parallel over the entire sample time period from 1976 to 2006.

In Figure 8, we separately graph the trends in LFP rates of women in the two countries by education level. All of the catching-up in LFP of younger women in Hong Kong can be attributed to trends in the LFP of higher and middle educated women. Highly educated mothers, whose youngest child is less than five, started participating in the labor market at almost the same rate as mothers of older children before 1986. Since then, they generally have higher participation levels compared to mothers of older children. Highly educated mothers of young children in Taiwan, on the other hand, show very high levels of labor force participation, and although the gap between their LFP rates and that of mothers with older children is small, it has stayed permanently below. The catch-up in

domestic or childcare duties at home. For our purposes, we do not draw a distinction between foreign caretakers and foreign domestic helpers in Taiwan. It is likely that the total stock of foreign caretakers and foreign domestic helpers is an upper bound for the number of foreigners performing domestic childcare duties in households in Taiwan.

labor force participation of medium skilled mothers with young children in Hong Kong started in the early 1990s. They reach participation levels comparable to those of mothers with older children by the late 1990s, but diverge again at the end of our period of analysis. These employment patterns are broadly consistent with trends in the relative wages of native women as a fraction of the wages of FDWs as shown in Figure 2. Relative wages of high skilled women increased rapidly in the early 1980s, and by the mid 1980s, was about four times that of the minimum wage of FDWs. The relative wages of medium skilled women increased steadily over the time period, albeit at a slower pace than that of high skilled women. Convergence in LFP rates for medium skilled mothers with younger children occurred in the mid-1990s when relative wages were about three times that of the minimum wage of FDWs. The employment trends of lower-educated females in both Hong Kong and Taiwan appear to be mostly similar for both groups over the sample time period. Relative wages for this group of mothers increased relatively slowly over time but appears to be too low to justify the cost of hiring a FDW. Overall, these findings are consistent with the view that higher educated women are more likely to respond to changes in the price of domestic services due to their higher opportunity cost of household production.

Nonetheless, these figures do not control for changes in the composition of both groups of women over time - to the extent that there may be differential changes in the composition of mothers with older or younger children across time, these effects may confound the aggregate trends that we observe in the graphs. In the next section, we will provide formal econometric evidence that adjusts for such composition effects.

3.3.1 Formal Econometric Evidence

We estimate the regression analogue of Figures 7 and 8, adjusting for relevant individual covariates such as age and education:

$$Y_{ijgt} = \gamma_{jt} + \lambda_{tg} + \tau_{jg} + \beta_t D_{jgt} + \delta X_{jgt} + \epsilon_{ijgt} \quad (1)$$

where i is the individual, j is the country, g is the group (whether female has older or younger child) and t is the time period. The time period, t , can take the values of a dummy for 1976-1984, 1985-1987, 1989-1993, 1994-1998, 1999-2002 and 2003-2006. Note that the Taiwanese data only starts in 1978 while the closest census year available for Hong Kong is 1976. For most of our cross-country analysis, we will compare 1976 LFP rates in Hong Kong with 1978 LFP rates in Taiwan.¹⁰ Vector X_{jgt} are individual-level controls for age and education. D represents the relevant indicator variables; $D_{jgt} = 1[HK = 1, Youngchild = 1, period = t]$. Some specifications also include

¹⁰In some figures, employment data for Hong Kong in 1976 are labeled as 1978 for ease of comparison with 1978 employment data in Taiwan.

education group \times period fixed effects and education \times period \times HK fixed effects. Standard errors are clustered at the country-period level.¹¹

The main results are presented in panel A of Table 2. The first column of each time period is the raw, unadjusted, difference. The second column adjusts for an individual's age and education and the third and fourth columns include education fixed effects interacted with year and country \times year. The first row suggests that, relative to mothers of older children, mothers of younger children participated less in HK than in Taiwan. The results for the most flexible specification indicate that relative to 1976-1984 (the base period), the gap between HK and Taiwan started closing in 1985-1987; by 1989-1993 there was no difference between the two countries, and by the mid 1990s-early 2000s the relative participation of mothers of young children vs. older children in HK was 6 to 9 percent higher than the relative participation of mothers of young children in Taiwan. In 2003-2006 the difference decreased slightly to 3 to 6 percentage points. Summarizing, between 1976 and 2006 the gap in LFP rates between mothers of younger and older children decreased by between 8.9 to 12.7 percentage points more in HK than in Taiwan.

Panel B of Table 2 analyzes whether the evolution of female labor force participation rates varies by the educational attainment of the women. Highly educated mothers of young children were the first to significantly increase their labor force participation. By the mid 1980s (a few years after the first FDWs came to HK), their relative labor supply had achieved its maximum. On the other hand, medium educated mothers of young children only started to significantly increase their relative LFP in the early 1990s, in line with the secular decline in the relative price of hiring a FDW. As predicted by the model in the next section, declines in the relative cost of the FDWs prompted more and more women to start hiring them and participating in the labor force. Finally, we observe very small effects on mothers with the lowest education levels, at least until the last period. This is not surprising as the potential wage of most mothers in this group is way below what it needs to be to justify hiring an FDW. Hence, changes in the prices of domestic help had little effect on their labor force participation.¹²

¹¹It is likely that the error terms are not only correlated within country \times period groups (which we address by clustering by country \times period) but also across time generating serial correlation issues. A common approach is to cluster at a higher level. In our case it will imply clustering at the country level, but that will leave us with only two clusters. We increase the number of clusters by assuming independence across education groups within countries and clustering at the country \times education group. Standard errors clustered at this level are presented in square parenthesis in panel A of Table 2.

¹²Note that unskilled women are much more likely to belong to lower income households, and thus might not be eligible to hire a FDW.

4 Micro Approach: A Structural Model of Female Labor Supply

In this section, we develop and estimate a structural model of labor force participation and the decision to hire a FDW using pooled cross-sectional data from the 2001 and 2006 Hong Kong population census. The advantage of deriving our empirical specification from an economic model of behavior is that we can interpret the estimated coefficients as meaningful parameters related to women's demand for outsourcing household production. We can also simulate the counterfactual supposing no foreign domestic program to estimate the microeconomic effects of the program on female labor supply. This will enable us to compare the estimates from the structural model to the macro difference-in-difference estimates.

4.1 Model

We consider a static model of utility maximization, where we assume that fertility and education are exogenously determined.¹³ Women maximize a utility function that depends on the consumption of a market good and leisure, subject to budget and time constraints. There are two discrete choice variables: labor force participation (LFP) and the decision to hire a foreign domestic worker (FDW)¹⁴. The woman's problem is:

$$\begin{aligned} \text{Max} \quad & U(c, l) \quad \text{st.} & (2) \\ I + LFP * w & = c + FDW * w_n \\ l & = T - d - LFP * h \\ f(d, FDW) & = \bar{R} \end{aligned}$$

where I is unearned income, w is the market wage for the woman, w_n is the monetary cost of hiring a FDW, T is total time, d is the woman's own time devoted to household work, and h is the fixed number of working hours. \bar{R} is the fixed amount of household work and childcare needed to keep a household running smoothly; it is produced using the woman's time and the FDW . We do not impose any constraint on the degree of substitution between the woman's time and that of the FDW . \bar{R} and f will depend on the household composition of the family, in particular, the presence of children younger than 5.

¹³In future work, we plan to endogenize fertility choices.

¹⁴We do not model or estimate the effect on intensive margin of labor supply because number of hours worked are not reported in the Census. Note, however, that in Hong Kong part-time jobs are very rare, only 10 percent of the working women in our sample report working less than 35 hours per week.

We assume the utility function is additively separable and linear in consumption:

$$U(c, l) = c + g(l; FDW) \quad (3)$$

We assume that the marginal utility of leisure depends directly on the presence of a *FDW* at home. Evidence suggests that the presence of a *FDW*, keeping time-use constant, has potential negative effects on privacy and family life quality in general (Lan, 2003). Without this assumption, it is difficult to explain why very rich women with no children rarely hire a *FDW*. We also allow the function g to vary by observable characteristics of the woman x_i , that might include, for example, the education level of the woman and the age composition of her children.

The woman faces four mutually exclusive alternatives denoted by j : $j = 0$ if $LFP = 0$ and $FDW = 0$, $j = (p)articipate$ if $LFP = 1$ and $FDW = 0$, $j = f(d)w$ if $LFP = 0$ and $FDW = 1$, and $j = pd$ if $LFP = 1$ and $FDW = 1$.

Normalizing $U_0 = 0$, we have that the reduced form for the utility attached to each alternative is:

$$U_p = \tilde{w} + \beta_1 + \beta_2 x_i + \varepsilon_2 \quad (4)$$

$$U_d = -w_n + \delta_1 + \delta_2 x_i + \varepsilon_3$$

$$\begin{aligned} U_{pd} &= U_p + U_d + \text{complementarity/substitution} \\ &= \tilde{w} - w_n + (\beta_1 + \delta_1 + \pi_1) + (\delta_2 + \beta_2 + \pi_2)x_i + \varepsilon_2 + \varepsilon_3 \end{aligned} \quad (5)$$

We interpret ε_3 as an unobserved component of the utility from hiring a *FDW*, ε_2 is the unobserved determinants of the woman's wage and \tilde{w} is the predicted wage based on observables. Formally:

$$w = \alpha_0 + \alpha_1 * age + \alpha_2 * age^2 + \alpha_3 * Education + \varepsilon_2 = \tilde{w} + \varepsilon_2.$$

β_1 represents the disutility from working in the market, δ_1 is the utility of the extra leisure available to the woman from hiring the *FDW* net of potential disutility from loss of privacy, etc., and through β_2 and δ_2 , we allow these parameters to vary with observable characteristics of the woman.

The utility of both working and hiring a *FDW* (U_{pd}) is defined as the sum of the utilities of each action separately modified by potential interactions (positive or negative) between the two, which we model with the π 's. Specifically, the complementarity/substitution effect is modeled as $\pi_1 + \pi_2 x_i$, where π_1 is the constant effect across all women and π_2 allows the interaction effect to vary across different groups of women.

A positive interaction coefficient implies that the decisions of whether to hire a FDW and of working in the market are complements (Gentzkow 2006), and therefore, changes to variables that affect the utility of hiring a FDW, for example a reduction in the minimum wage of foreign domestic helpers, will not only induce women to outsource more household production, but also to join the labor force. This complementarity is closely related to the degree of substitution between a woman's time and that of the FDW in caring for children and doing household chores. Given that most people in Hong Kong work full-time, if a woman participates in the labor market, hires a FDW and has a young kid, most of the childcare is going to be provided by the FDW without the mother being present (unlike the case when a FDW is hired but the mother stays at home). The complementarity might also come from a woman's ability to work in higher paying jobs because of the flexibility in working hours allowed by hiring the FDW. Note that we allow the interaction π_2 to vary by observable characteristics of the woman. In particular, for the reasons stated above, we might expect the complementarity term to be especially large for women with very young children. The interaction terms are key in predicting the effect of the foreign domestic worker program on the labor supply of women and to study which groups of women are most likely to change their participation decisions as a result of the program.

We restrict the δ 's, β 's, π 's and α 's to be constant across individuals and assume that the x 's to be independent from the error terms. The variance-covariance matrix of the error terms takes the following form:

$$\begin{bmatrix} \varepsilon_2 \\ \varepsilon_3 \end{bmatrix} \sim N\left(0, \begin{bmatrix} 1 & \sigma \\ \cdot & 1 \end{bmatrix}\right)$$

As the above expression suggests, we are modeling our discrete choice maximization problem as a multivariate probit. Note that we are imposing an additional restriction beyond what is needed to set the scale of utility and assuming there is no unobserved complementarity component ($\varepsilon_2 + \varepsilon_3 = \varepsilon_4$).

4.2 Identification

We have already normalized the model to account for the fact that the level and scale of utility are irrelevant. While a normalized multivariate probit is formally identified as long as the model includes at least one variable that varies at the individual level (Heckman and Sedlacek, 1985), in the absence of exclusion restrictions, the model is extremely fragile (Keane, 1992). Without an exclusion restriction, there is no variation in the data that allows us to discern if women who work and hire a FDW choose this alternative because of the complementarity between the two choices or because of a strong correlation between the unobserved determinants of the choices' utilities. Identification of the correlation coefficient relies solely on functional form assumptions.

To solve the identification issue we use the number of rooms as an instrument. We argue that this variable is likely to have a direct effect on the utility from hiring a FDW but arguably does not enter the utility from working in the market directly. Intuitively, the idea behind how this exclusion restriction identifies the complementarity term is the following: Suppose there are two identical households that only differ in the number of rooms in the house. Complementarity between LFP and hiring a FDW implies that the woman living in the house with an additional room will be more likely to work in the market. In the absence of an interaction between the two choices, women in both households should be equally likely to participate in the labor force. We will discuss the validity of the exclusion restriction in detail in the next section.

Note that we cannot identify all parameters in our model. Because there is no variation in the minimum wage across households and we do not observe wages for women who do not work, we cannot identify the disutility of working (β_1) and the utility of the extra leisure available to the woman from hiring the FDW (δ_1).

Before turning to the discussion of the instrument, in Table 3 we present the summary statistics for the sample that will be used in the empirical analysis in this section.¹⁵ As mentioned before, the sample is drawn from the 5% sample of the 2001 and 2006 Hong Kong Census. We restrict our sample to married mothers aged 25 to 44; the lower limit is set such that most women would have completed their education by that age, while the upper limit is chosen to ensure that all her children are likely to be still living with her.

4.3 Proposed Instrument

The instrument that we use is the number of rooms in the household. The motivation behind this instrument is the fact that space limitations in Hong Kong coupled with restrictions on lodging for domestic workers¹⁶ imply that all else equal, a household living in a house with more rooms is more likely to hire a domestic worker. Hence, assuming we are able to control adequately for household wealth, we would not expect the number of rooms in the house to be correlated to an individual's unobserved work propensity. There are a number of concerns in using the number of rooms as an instrument. We discuss each of these concerns in detail.

Issue 1: Moving concerns

The first concern is that exogeneity of this instrument implicitly requires that individuals either

¹⁵Note that the share of mothers with a FDW is lower than in Figure 3. The reason is that the sample used in the micro approach includes only women that live in places with 3 or 4 rooms. See Table A5 for the distribution of number of rooms across the population.

¹⁶For example, it is stated in the employment contract that they cannot sleep in the kitchen or share a room with an adult of the opposite sex

face prohibitively high moving costs or that some frictions in the housing market limit the ease of moving. Since we only have cross-sectional data, it is not clear whether the observed relationship between the number of rooms and the probability of maid hire reflect space constraints or households moving to a larger place when they decide to hire a maid. Such actions by the household may lead to endogeneity in the choice of the number of rooms in the household.

We follow two strategies to address this concern. First, we present models with the sample restricted to women living in subsidized sale flats. Due to limited space and the high costs of housing, almost half of the population in Hong Kong resides in some form of government housing while the remainder lives in private housing. In 2005, 29.1% of households were tenants in government provided housing while another 15.8% owned subsidized flats¹⁷ through the Home Ownership Scheme (HOS) (Census and Statistics Dept, 2006). For individuals residing in government subsidized housing, mobility and choice are rather limited due to various restrictions imposed on the resale and allocation of flats.

The HOS allows citizens in just the right income bands¹⁸ to buy their flats at the cost of construction and get the land element for free. This normally means discounts of between 30 percent and 50 percent on private flat prices. Each year the government offers a given number of flats for sale. The flats are in very large projects constructed by the government for this purpose. Each household can apply for a flat in only one project and does not have to state its preferred number of rooms or size of the flat. Applications usually outnumber supply by huge numbers; for example, in 1994, 112,345 families applied to buy the 8,168 flats offered. Allocation is based on a computer ballot that determines the flat selection sequence. After the third year of occupancy, HOS flat owners may sell their flats in the open market, but only after paying a premium to the Housing Authority, which is equal to the value of the subsidy at prevailing market prices. Additionally, if they sell they become ineligible to apply for subsidized housing in the future. Referring to the allocation and resale rules of the HOS, the South China Morning Post states "Thus, most of the buyers are forced to stay where they are, irrespective of where they would like to be, which they never had much choice of anyway when they bought their homes."

Second, using the entire sample, we can explicitly test whether households that have moved in the last five years are more likely to hire domestic helpers. In results presented in Appendix Table A4, we find that having moved in the past 5 years is uncorrelated with a higher probability of having a domestic worker. We also perform this test on a subset of households whose only child is five or younger. Given that the probability of maid hire increases substantially when a household has young children, this group of households is likely to be first-time employers of foreign maids. Hence, looking at their moving behavior in the previous five years provides a test of whether households move in anticipation of hiring a foreign maid. The results for this subsample of households with

¹⁷In our sample, the share living in subsidized sale flats is higher at 24 percent.

¹⁸The upper limit has always been above the minimum income required to hire a FDW.

small children are also not statistically significant and very small. We interpret these results as suggesting that families are not moving in large numbers to accommodate a foreign domestic worker. To complement the evidence in Table A4, we will also present estimates of our labor supply models using a subsample of households that did not move in the last five years. We will compare the estimates obtained from the full sample to the sample of non-movers to see if this is indeed a large concern.

Issue 2: Omitted household wealth

Our instrumentation strategy is only valid if we are able to control adequately for determinants of household wealth that are correlated with the number of rooms. Since richer households tend to have a larger number of rooms and are more likely to hire a foreign domestic helper and to not participate in the labor force, omitting household wealth would underestimate the degree of complementarity between the two decisions.

To circumvent this problem, we restrict our sample to households that have 3 or 4 rooms¹⁹, and define our instrument as a dummy for having 4 rooms. We do this for two reasons. First, given that we are looking at families with at least one child and assuming one room is the couple’s bedroom, the second is the child’s and the third is the living or dining room, going from 3 to 4 rooms will surely relax the space constraint. Second, even after controlling for husband’s wage, owning very large houses (5, 6, or more rooms) or very small ones (1 and 2 rooms) are likely to be a good proxy for unearned income, especially given how unusual they are.

As additional evidence that our instrument is not merely proxying for an individual’s unobserved propensity to work or unobserved household wealth, we also run “placebo” tests of the reduced form of having 4 rooms on labor force participation for subsets of households that have a very low probability of maid hire, such as married households without children and low income households who are not eligible to hire a foreign maid. In particular, we estimate the following linear regression:

$$LFP_{it} = \alpha + \delta I(\text{Number of rooms} = 4)_{it} + \gamma X_{it} + \eta_t + \theta_k + \epsilon_{ijt} \quad (6)$$

and its probit counterpart. We run the above specification for three groups of women: (1) married women with children (our main sample), (2) married women with no children, (3) low-educated mothers whose husband earns less than 10,000 HK dollars per month (the bottom quartile of the wage distribution). The share of households with an FDW for the three groups is 14 percent, 2.6 percent, and 1.5 percent, respectively. If our instrument merely proxies for an individual’s unobserved propensity to work, we would expect to find a significant positive relationship between the number of rooms and the employment status of females in these households, regardless of their

¹⁹For tabulations of number of rooms by education level of the woman see Table A5 of the Appendix.

low demand for domestic services. However, if δ is only significant in the sample of households that have a relatively high demand for domestic help, then this suggests that the number of rooms affects the employment decisions of females through its impact on maid hire, as opposed to merely proxying for some unobserved variables that might be correlated with the individual’s propensity to work.

Table 4 presents the results: the coefficient for the sample of married women with children is positive and highly significant, the coefficient is negative and not significant for married women with no children, and positive, but half the size and not statistically significant, for low educated mothers with low unearned income. The lack of a significant reduced form relationship between our instrument and the employment probability of females in these households that have a relatively low demand for maid services is reassuring and further reinforces the validity of our instrument.

4.3.1 Structural Estimates

We estimate model (4) using the simulated maximum likelihood (SML) implemented by the Geweke-Hajivassiliou-Keane algorithm.²⁰ Table 5 presents results for three samples: (A) mothers aged 25 to 44 who live in houses with 3 or 4 rooms, (B) subset of (A) who live in subsidized sale flats, and (C) subset of women that reported not having moved in the past 5 years. We include in all equations the following economic and demographic variables: dummy for youngest child aged 0 to 5, number of children, dummy for a person aged 65 or older living in the household, household size, dummies for the education level of the woman, the woman’s age and age squared, and the log of husband’s income²¹. We allow the interaction/complementarity coefficient to vary by the age of the youngest child and by the education level of the woman. For all other variables we impose the restriction that the coefficient in the equation representing the utility of both working and hiring a FDW is the sum of the coefficients in the LFP and the FDW equations. The last column of each panel shows the estimate of the complementarity in the LFP and FDW decisions and its statistical significance. Our instrument, of course, is omitted from the equation of participating in the labor market and not hiring a FDW.

Most of the coefficients in the utility equations are statistically significant. The coefficients in the labor force participation equation (Column (1)) are consistent with the model: the coefficient for women with higher education (and therefore higher potential wage) is positive and highly significant and the husband’s income coefficient is negative. However, contrary to what is expected if there

²⁰This is estimated using the STATA command, *mvprobit*.

²¹Even though in our simple model unearned income would be differenced out by the comparison to the utility of the default alternative, we include it in our estimations as proxy for other unobserved factors, such as socioeconomic status, which might also be correlated with our instrument.

are positive returns to experience, the age coefficient is negative. One potential explanation is that older women might have a higher potential wage but also higher disutility from working (we cannot separately identify each effect). Another possible explanation, which we cannot capture because of the static nature of our model, is that older women may have a shorter time horizon for recouping the future benefits of current participation.

As expected, having many children, and in particular young children, significantly reduces the utility of working in the market. The constant in the utility equation for hiring a FDW and not participating in the labor market (Column (2)) suggests that this alternative is only attractive for women with very wealthy husbands and many children. For these women, the availability of FDWs has not changed their labor force participation decisions, but has allowed them to enjoy more leisure time. The positive and significant coefficient on the dummy for a person in the household older than 65 suggests that FDWs are also valuable in helping taking care of the elderly. Our instrument is positive and statistically significant.

Column (3) in the panels present the coefficients in the equation of the utility of both hiring a FDW and participating in the labor market, and in Column (4) we compute the implied complementarity effect and its significance. We find positive and statistically significant complementarity effects of jointly deciding to participate in the labor force and to hire a FDW. The complementarity is especially large for women with very young kids and for those who are more educated. The strong interaction effect for those with a young child suggests that women view FDWs as a very good substitute for their time spent in childcare. Note that in Hong Kong most people work full-time, hence the child will spend many hours of her day with the FDW. A potential interpretation for the larger complementarity for better educated women is that they work in occupations that value flexibility, and therefore, hiring a FDW increases the returns to working. Note that these results are robust to allowing complementarity effects to vary by all the observed controls (See Table A6).

Panels (C) and (D) of Table 5 reproduce the exercise reported in panel (A) but restricting the sample to women for whom the number of rooms is less likely to have been endogenously chosen. Results are very similar for the sample of non-movers, both in direction and magnitude of the coefficients. For the sample of women living in subsidized sale flats all the coefficients are in the same direction as for the whole sample and are relatively similar, only less precisely estimated, given the significantly smaller number of observations.

We estimate a negative correlation coefficient between the unobserved determinants of labor force participation and the decision to hire a FDW, suggesting that a naive estimation will underestimate the extent to which the availability of FDWs has changed the labor supply decisions of women. In specifications not shown here, we ran linear models of labor force participation on having hired a FDW. The OLS coefficient is positive, but significantly smaller than the 2SLS specification that uses the number of rooms as an instrument.

Thus far, we have only discussed the direction of the effects of the observables on the utility of the different alternatives. To translate the magnitudes of the coefficients to willingness to pay in HK dollars, we need a way of converting utils to dollars. To do so, we use the coefficient of the variable having an extra room²², combined with an estimate of the cost of getting the extra space to transform the interpretation of the coefficients from utils to dollars. Although this is clearly an imprecise approach, it allows us to check whether our estimates are sensible. Based on census data on monthly mortgage payments, the monthly cost of having an extra room is between 2000 to 2500 Hong Kong dollars (260 to 325 US dollars). From the structural estimates in Table 5, having an extra room increases the utility from hiring a FDW by 0.25 to 0.3 utils, therefore a util corresponds roughly to 6500 to 10000 HK dollars. Applying these numbers to the difference between the utility levels of two women identical in all observable and unobservable characteristics²³ except in the age of the youngest child, we find that women with a child aged 0 to 5 are willing to pay between 3300 to 6000 HK dollars (429 to 780 US dollars) more than women with an older child to have the option of hiring a FDW at the current prices. Is this a reasonable number? Suppose that the alternative is to hire a female low-skilled native; the average full time wage for a low education native is about 3800 HK dollars higher than the minimum wage for the FDW. This number is in the lower range of our estimate of the willingness to pay. Our numbers also imply that, *ceteris paribus*, a woman with a college degree is willing to pay at least between 7150 and 13000 HK dollars more than a woman with low education. The average wage difference for high versus low skilled women is at least double this range. If contrary to our simplifying assumption, but more realistically, utility is a concave function of consumption, we should expect the willingness to pay to be smaller than the wage difference. We cannot judge, however, if it should be half, more than half or less than half.

Using the util to dollar conversion we can also compute the consumer surplus derived from the availability of FDWs, which we define as:

$$CS = \text{Max}[0, \text{Max}(U_d, U_{pd}) - \text{Max}(U_p, 0)]$$

Table 6 presents our estimates. Our model implies that because of the program, mothers of children aged 0 to 17 in Hong Kong enjoy an average monthly consumer surplus of between 550 to 850 HKD (72 to 110 US\$). As observed, mothers of younger children have an average consumer surplus twice as large as the consumer surplus for mothers of school age children. The results also suggest that the program has disproportionately benefited highly educated women.

²²We have constrained the dummy for having 4 rooms to be equal in the two equations that it enters. Estimations of the model without imposing this restriction strongly suggest it is reasonable to do so.

²³Chosen to guarantee a positive willingness to pay.

4.4 Comparing Macro and Micro Estimates

To compare the macro and micro estimates, we use the structural model to simulate the program effect on the labor force participation of mothers. We simulate the optimal labor supply choices when the relative price of hiring a FDW is set at the early 1980s level.²⁴ We do this separately for mothers of younger and older children to construct a difference-in-difference estimator comparable to the macro estimates. Table 7 presents the results. Our micro difference-in-difference estimates suggest that the decline in the relative price of hiring a FDW from its level in 1980s to its level today resulted in an increase in the relative labor force participation of younger vs. older children of 12.4 to 13.2 percentage points. As with our macro approach, the labor supply change comes mostly from mothers with medium to high levels of education.

The similarity between the macro and micro estimates is remarkable given their use of different sources of variation. This suggests that our estimates of the effect of the program on female labor supply are robust and reliable.

5 Conclusion

The outsourcing of household production to temporary foreign domestic helpers is a distinctive feature of many newly industrialized nations. Moreover, this form of migration is also becoming increasingly prevalent in some developed countries as a result of demographic changes and increasing demand for household services as women seek to enter the labor market.

In this paper, we find that temporary foreign domestic helper policies significantly increased female labor force participation rates in Hong Kong especially for mothers of young children. Reduced-form estimates from comparing labor force participation rates over time in Hong Kong versus Taiwan and simulations from a structural model of female labor supply imply that the program raised the labor force participation of mothers of young children in Hong Kong by between 9 to 13 percentage points relative to mothers of older children. These labor supply effects are concentrated among relatively medium and highly skilled women, consistent with the fact that these women face higher opportunity costs of household production. Moreover, the program has increased the welfare of women in Hong Kong significantly, especially for mothers of younger children and mothers with high levels of education. The results from the structural model suggest that mothers regard FDWs

²⁴More specifically, what we do is the following: we predict the individual level utilities for each alternative at the 2001 minimum wage using our estimates from Table 5 and random draws from a multivariate standardized normal distribution with correlation coefficient $\hat{\sigma}$. We take these predicted utilities and subtract the difference in utils between the 1981 and 2001 cost of hiring a FDW. We calculate how many women will have chosen to work at the 2001 minimum wage level and how many at the much higher 1981 level.

as a good substitute for their time spent in household production.

The influx of domestic migrant workers is likely to have different economic implications on the host country labor market as compared to conventional low-skilled migrants. Since these workers substitute for household production, they free up native women to take up employment in the labor market and potentially allow them to enter more demanding occupations. That we observe such large effects on labor supply decisions in response to the decrease in childcare costs as a result of the FDW program also suggests that at least part of the differences in labor market outcomes of men and women can be attributed to constraints that women face in juggling their dual roles in the household and labor market. These results suggest that FDW programs can have important policy ramifications for encouraging women to enter the labor market and to bridge the gender gap. An important extension is to consider the possible fertility implications of the significant decline in childcare costs resulting from the availability of domestic helpers. This is particularly relevant to Hong Kong as it has one of the lowest fertility rates in the world. We hope to address these interesting questions in future research.

References

- [1] Baker, Michael, Jonathan Gruber and Kevin Milligan (2008). "Universal Child Care, Maternal Labor Supply, and Family Well-Being". *Journal of Political Economy*. Vol. 116(4), August, pp. 709-745.
- [2] Blau, David and Philip Robins (1988), "CHild-Care Costs and Family Labor Supply". *The Review of Economics and Statistics*. Vol. 70, pp. 374-381.
- [3] Chan, Annie (2006), "The Effects of Full-Time Domestic Workers on Married Women's Economic Activity Status in Hong Kong, 1981-2001". *International Sociology*. 21(1):133-159.
- [4] Chiu, Stephen W.K. (2004), "Recent Trends in Migration Movements and Policies in Asia: Hong Kong Region Report". Paper prepared for the "Workshop on International Migration and Labour Markets in Asia," Japan Institute of Labour.
- [5] Connelly, Rachel (1992), "The Effects of Child Care Costs on Married Women's Labor Force Participation". *Review of Economics and Statistics*. Vol. 74, pp. 83-90.
- [6] Cortes, Patricia and Jose Tessada (2009), "Low-skilled Immigration and the Labor Supply of Highly Educated Women". Working Paper.
- [7] Gelbach, Jonah B. (2002), "Public Schooling for Young Children and Maternal Labor Supply". *American Economic Review* 92(1) pp. 307-22.

- [8] Gentzkow, Matthew (2007), "Valuing New Goods in a Model with Complementarities: Online Newspapers". *American Economic Review* 97(3) pp. 713-744.
- [9] Heckman, J., and Sedlacek, G. (1985), "Heterogeneity, Aggregation, and Market Wage Functions: An Empirical Model of Self-Selection in the Labor Market", *Journal of Political Economy*, 93, 1077-1125.
- [10] Henshall, Janet (1999). *Gender, Migration and Domestic Service*. Routledge. London.
- [11] Keane, Michael P. 1992. "A Note on Identification in the Multinomial Probit Model." *Journal of Business and Economic Statistics*, 10(2): 193–200.
- [12] Kremer, Michael and Stanley Watt (2006), "The Globalization of Household Production." mimeo, Harvard University.
- [13] Lan, Pei-Chia (2003), "Negotiating Social Boundaries and Private Zones: The Micropolitics of Employing Migrant Domestic Workers" *Social Problems*, Vol. 50, No. 4, pp. 525-549
- [14] Suen, Wing (1993), "Market-procured Housework: The Demand for Domestic Servants and Female Labor Supply". *Labor Economics*. 1:289-302.
- [15] Yeoh, Brenda S. A., Huang, Shirlena and Gonzalez III, Joaquin (1999), "Migrant Female Domestic Workers: Debating the Economic, Social and Political Impacts in Singapore". *International Migration Review*. 33(1): 114-136

Figure 1. Trends in FDW Min wage and Native Avg. Wage

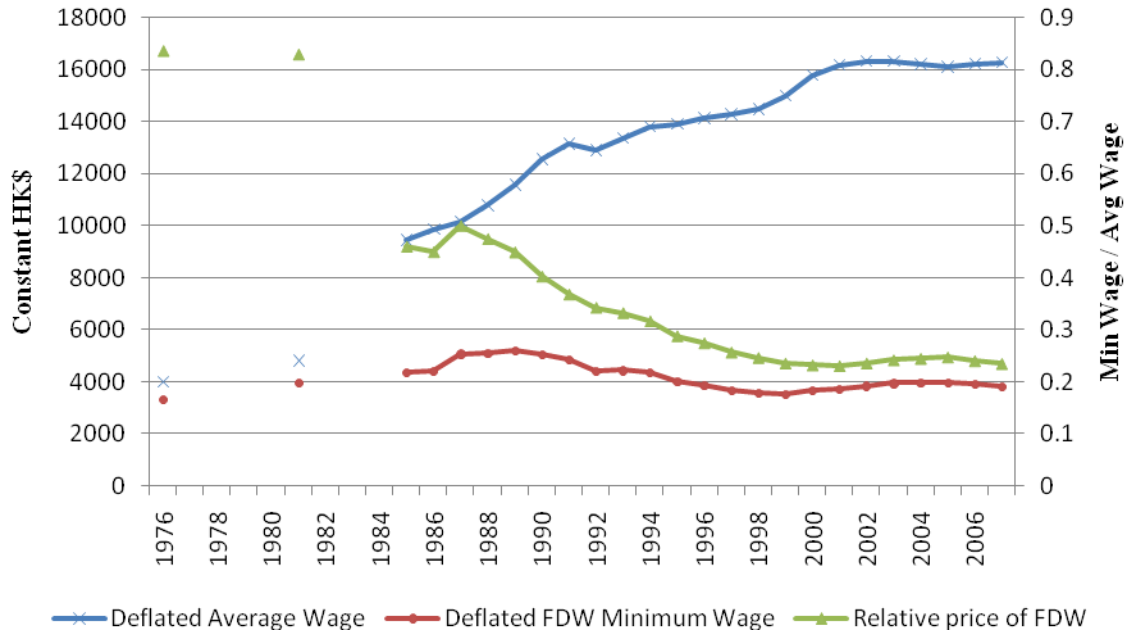
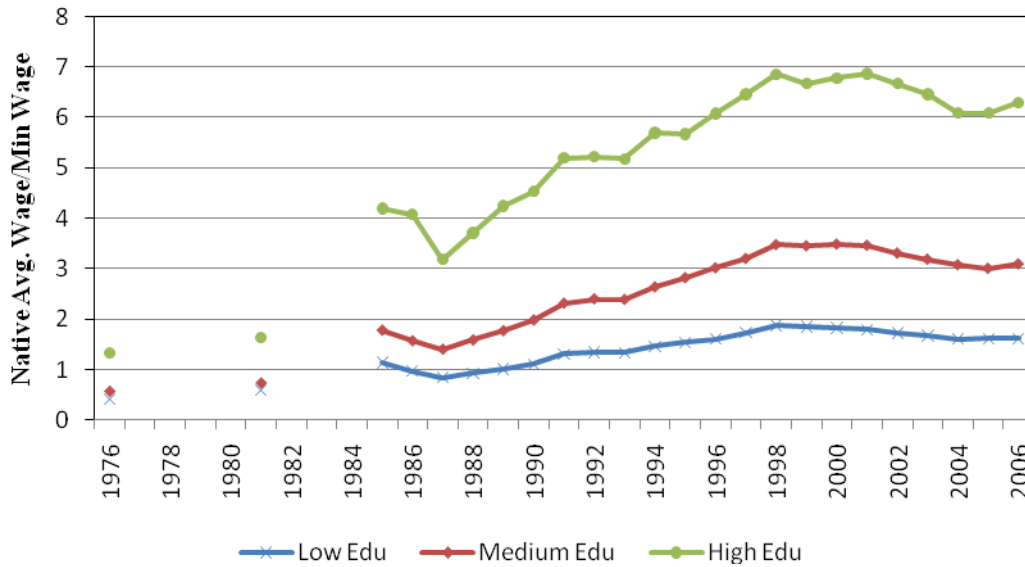
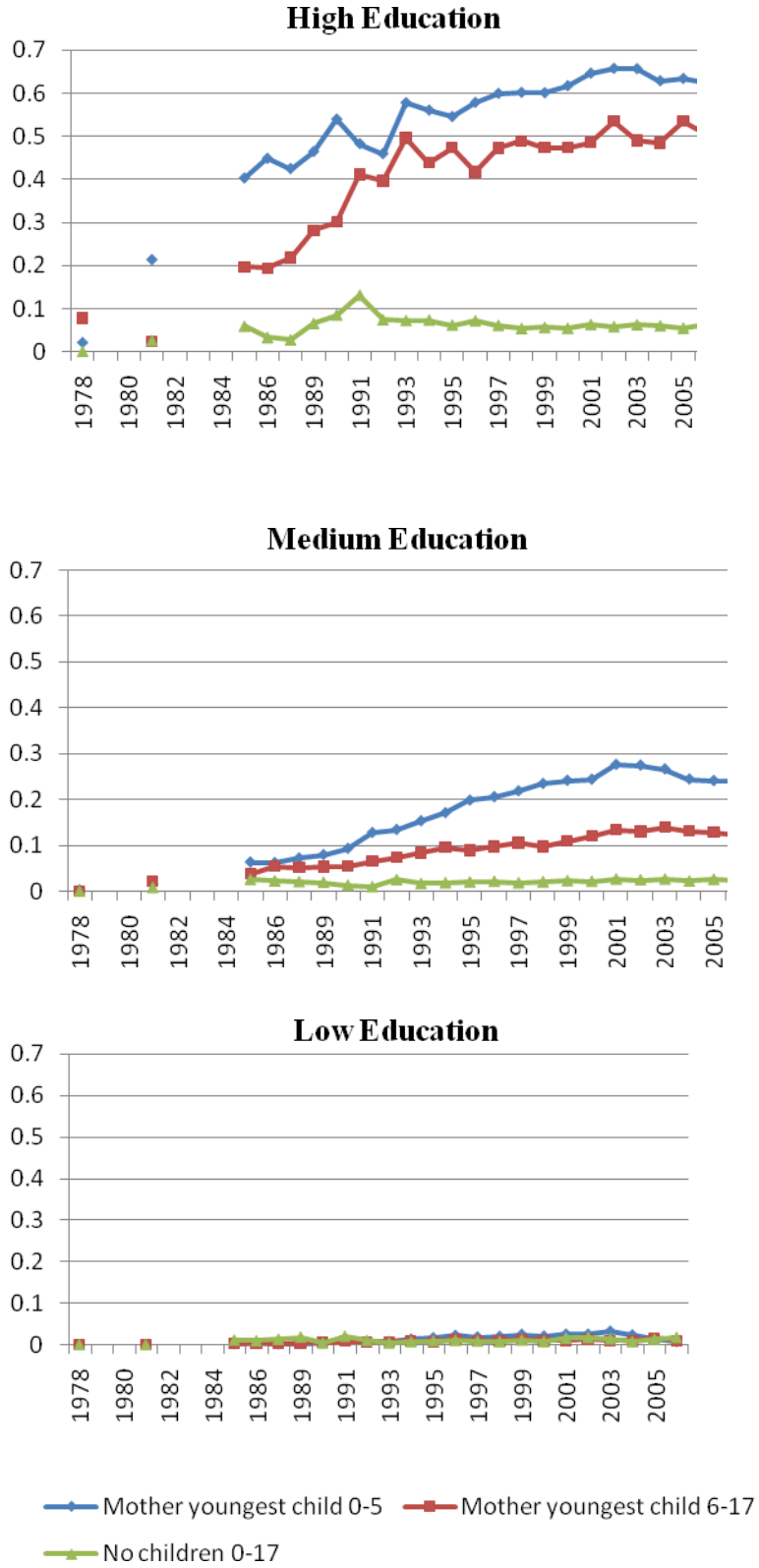


Figure 2. Relative Wage of Native Women to Min Wage of FDWs by Education Level



Source: Hong Kong data – 1976, 1981 HK Census and 1985-2006 General Household Survey, Taiwan data – 1978-2006 Taiwan Manpower Utilization Survey.
 Notes: Low education is defined as having at most primary education, medium as having more than a primary education but less than a college degree and high education as having a college degree or a graduate degree. The same classification applies to both Hong Kong and Taiwan.

Figure 3. Share of women with a FDW, by education level and age of youngest child



Notes: See Figures 1 and 2.

Figure 4a. The Market for Domestic Workers

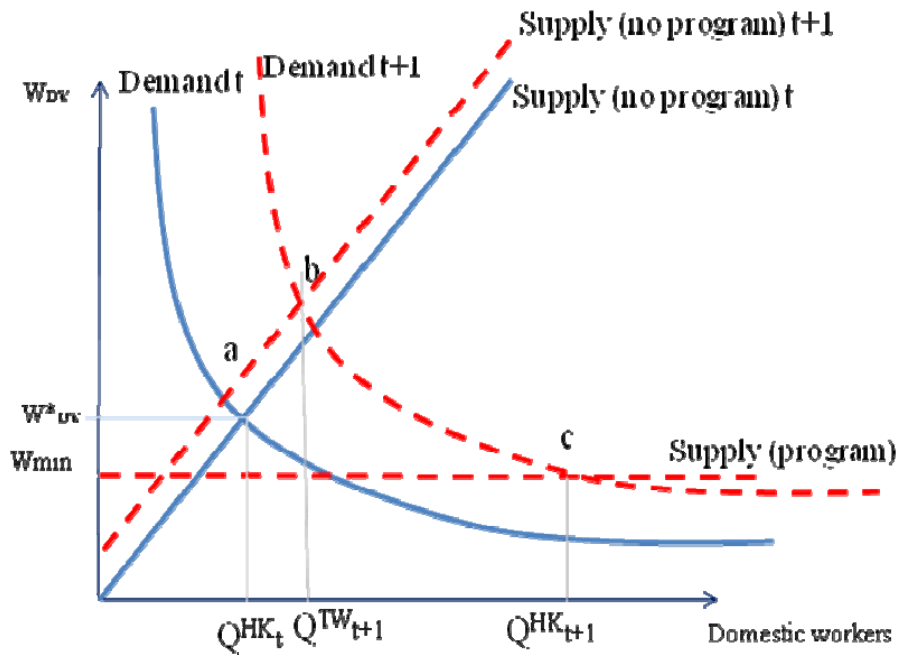


Figure 4b. The Market for Native Workers

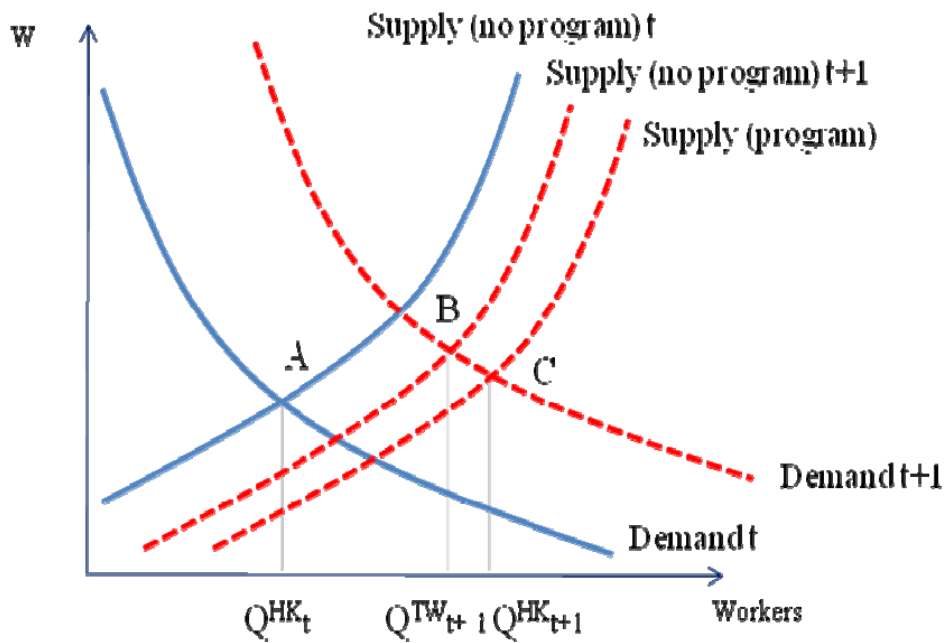
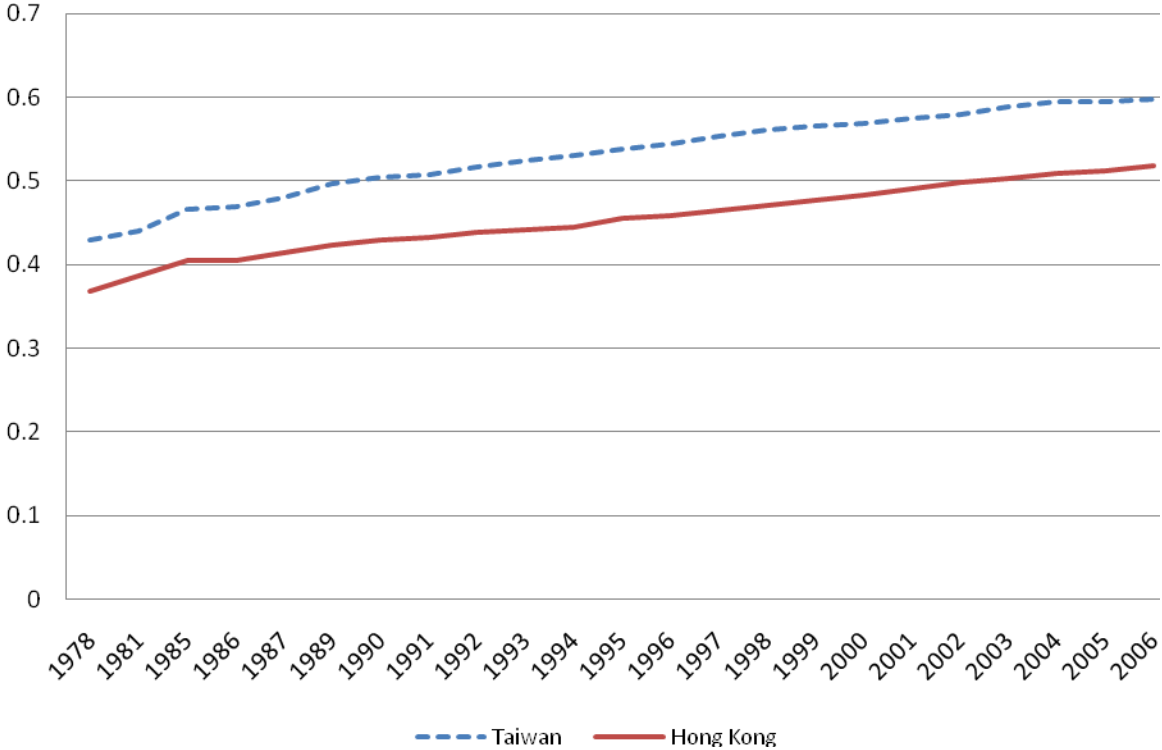
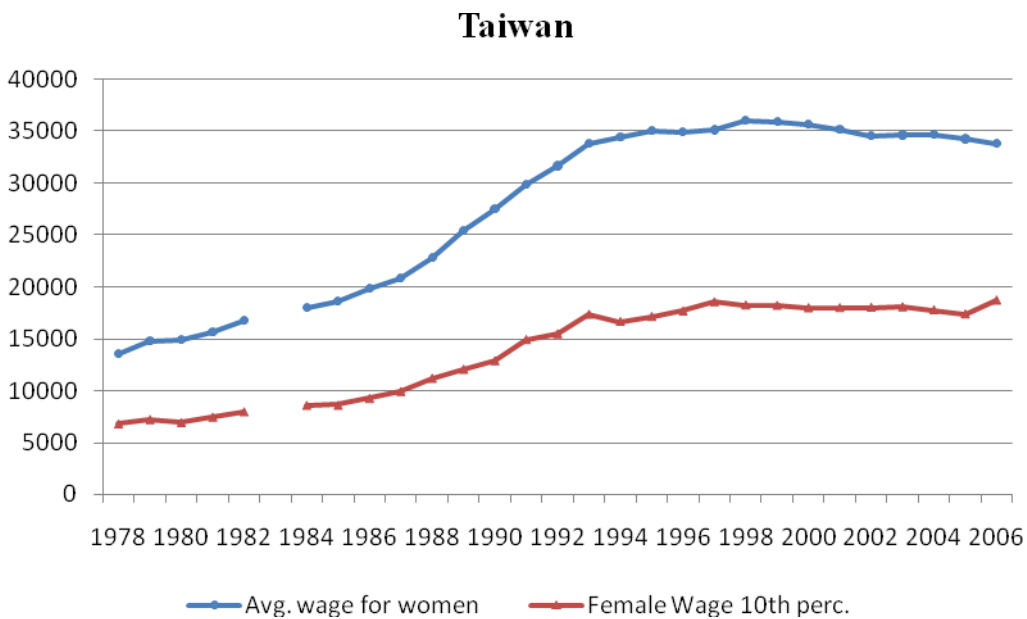
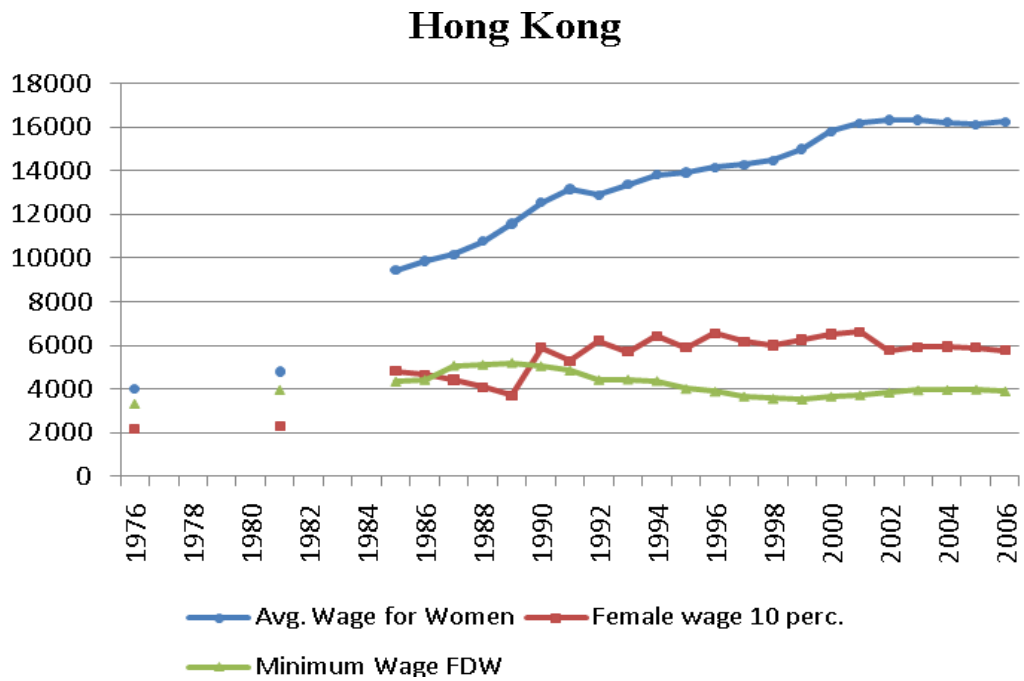


Figure 5. Evolution in the LFP of mothers due to changes in the distribution of observables



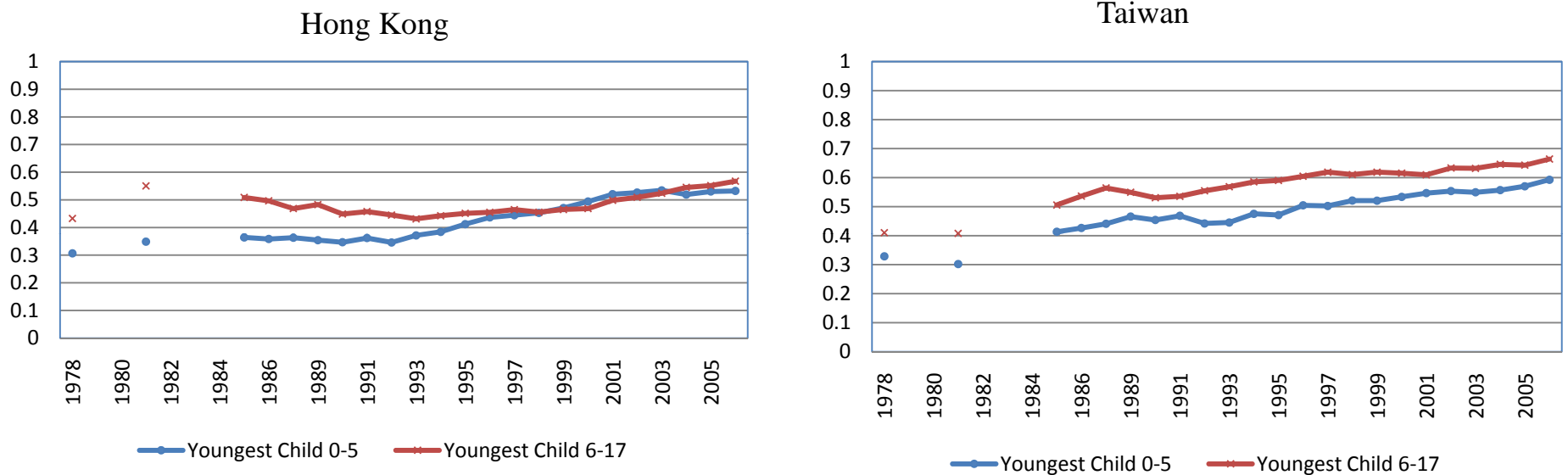
Note: The figure shows the predicted labor force participation of mothers in Taiwan and Hong Kong from a cross-sectional model using as explanatory variables: age dummies, education dummies, husband's income percentile dummies, dummy for youngest child aged 0 to 5, and a dummy for Hong Kong. The model is estimated using all available years.

Figure 6. The Evolution of Female Wages in Hong Kong and Taiwan



Notes: Wages are in local constant units. The exchange rate between the Hong Kong and Taiwan dollars fluctuated between 3.4 and 4.4 TW dollars per HK dollar.

Figure 7. Labor Force Participation of Mothers by Age of Youngest Child



Source for Figures 7 and 8: Hong Kong data – 1976, 1981 HK Census and 1985-2006 General Household Survey, Taiwan data – 1978-2006 Taiwan Manpower Utilization Survey.

Notes for Figures 7 and 8: The sample is restricted to mothers aged 25 to 44 with at least one child aged 0 to 17. Low education is defined as having at most primary education, medium as having more than a primary education but less than a college degree and high education as having a college degree or a graduate degree. The same classification applies to both Hong Kong and Taiwan

Figure 8. LFP of Mothers by Age of Youngest Child and Education Level

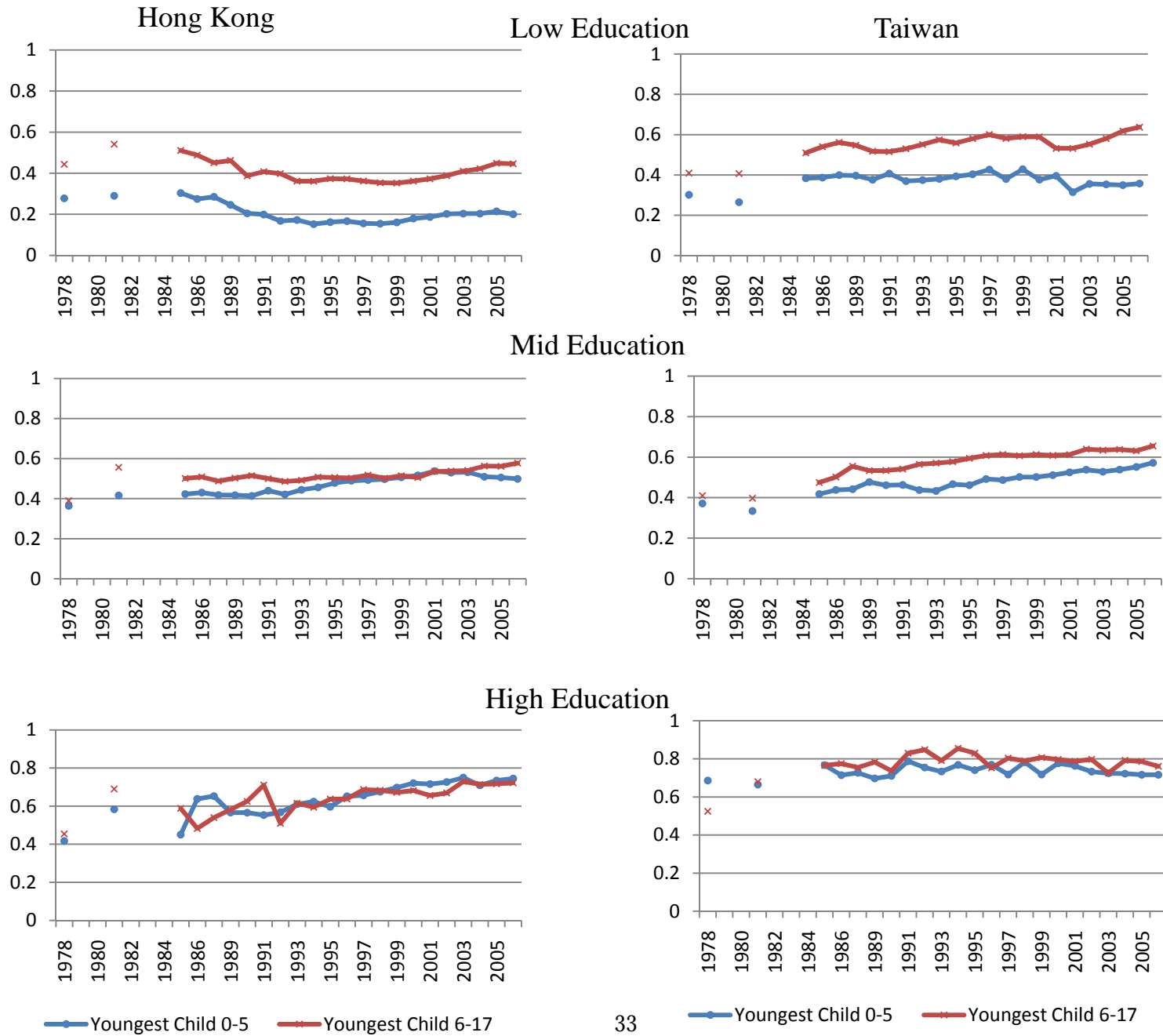


Table 1. Characteristics of Live-in Domestic Workers in Hong Kong

	1976	1981	1986	1991	1996	2001	2006
Share of Hhlds with a DW	0.015	0.013	0.020	0.033	0.059	0.074	0.075
Native	0.975	0.665	0.237	0.043	0.024	0.004	0.007
From Mainland	0.914	0.636	0.210	0.038	0.016	0.003	0.005
Foreigner	0.02	0.34	0.76	0.96	0.98	1.00	0.99
From Philippines	-	0.32	-	0.88	0.84	0.69	0.52
From Indonesia	-	-	-	-	0.09	0.26	0.45
Age	56.6	50.9	38.8	34.2	32.9	32.4	32.9
Ever Married	0.61	0.49	0.42	0.45	0.46	0.49	0.50
Less than Form 5	0.98	0.73	0.33	0.22	0.26	0.31	0.40
Form 5	0.01	0.23	0.34	0.40	0.36	0.17	0.20
Post secondary	0.01	0.01	0.20	0.18	0.15	0.37	0.29
College +	0.00	0.03	0.13	0.20	0.22	0.15	0.12
Speaks English	-	-	-	0.90	0.85	0.77	0.65
Speaks Cantonese	-	-	-	0.17	0.24	0.43	0.52

Source: HK Census and By-Census

Table 2. Triple Difference Estimation of the Effect of FDWs in the LFP of Mothers of Young Children vs. Mothers of Older Children, Taiwan vs. Hong Kong : 1978-2006

	Dependent Variable: Labor Force Participation						
	A. All Women				B. By Education Level		
	(1)	(2)	(3)	(4)	Low	Mid	High
HK*Child05 (Base period 78-84)	-0.065 (0.030) [0.051]	-0.074 (0.031) [0.050]	-0.063 (0.029) [0.039]	-0.063 (0.031) [0.039]	-0.079 (0.034)	-0.033 (0.042)	-0.179 (0.065)
HK*Child05*period 85-87	0.045 (0.033) [0.007]	0.043 (0.033) [0.008]	0.047 (0.032) [0.010]	0.039 (0.033) [0.011]	0.021 (0.037)	0.031 (0.045)	0.250 (0.098)
HK*Child05*period 89-93	0.073 (0.035) [0.022]	0.071 (0.035) [0.022]	0.078 (0.035) [0.009]	0.053 (0.034) [0.014]	0.017 (0.035)	0.060 (0.046)	0.210 (0.069)
HK*Child05*period 94-98	0.148 (0.032) [0.038]	0.147 (0.032) [0.038]	0.144 (0.031) [0.022]	0.109 (0.032) [0.021]	0.045 (0.034)	0.123 (0.043)	0.214 (0.069)
HK*Child05*period 99-02	0.163 (0.031) [0.064]	0.155 (0.031) [0.063]	0.141 (0.030) [0.009]	0.126 (0.032) [0.014]	0.071 (0.037)	0.124 (0.043)	0.274 (0.067)
HK*Child05*period 03-06	0.127 (0.032) [0.074]	0.124 (0.032) [0.072]	0.097 (0.031) [0.021]	0.089 (0.032) [0.022]	0.082 (0.040)	0.072 (0.045)	0.236 (0.066)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*HK FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child05*Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education*Period FE	No	No	Yes	Yes	-	-	-
Education*Period FE*HK	No	No	No	Yes	-	-	-
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	547656	547656	547656	547656	161708	351991	33957

Notes: The sample is restricted to women aged 25-44 who have at least one child aged 0 to 17. HK is a dummy variable if the respondent is from Hong Kong. Child05 is a dummy variable if the youngest child is aged 0 to 5. p85-87, p89-93, p94-98, p99-02, p03-06 are dummy variables that denote the time-period considered. Controls include age dummies and three dummies for the education level of the women. Standard errors in parenthesis are clustered at the country-year-1851 and in square brackets at the country-education level .

Table 3. Descriptive Statistics of Mothers Included in the Micro Approach Sample

	Sample											
	All		Subsidized H.		Non-movers		Low Edu		Med Edu		High Edu	
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
Has a FDW	0.15	0.36	0.12	0.33	0.13	0.34	0.03	0.18	0.22	0.41	0.45	0.50
Participates in the LF	0.55	0.50	0.56	0.50	0.55	0.50	0.43	0.49	0.64	0.48	0.75	0.43
Wage working (HKD)	13458	11303	11888	8210	12878	10410	7889	5873	14686	9713	27868	17800
Age	37.22	4.67	37.54	4.54	38.38	4.19	37.73	4.67	36.85	4.66	36.17	4.29
Low-Education	0.47		0.50		0.49							
Med-Education	0.45		0.46		0.45							
High-Education	0.08		0.04		0.06							
Hhld. Size	4.03	1.00	4.01	0.93	4.09	0.99	4.29	1.03	3.82	0.91	3.61	0.82
Dummy Child 0-5	0.39	0.49	0.36	0.48	0.30	0.46	0.29	0.45	0.45	0.50	0.69	0.46
Share of mothers of young child with FDW	0.24	0.43	0.23	0.42	0.25	0.43	0.06	0.24	0.30	0.46	0.51	0.50
Number of Children	1.74	0.76	1.72	0.72	1.81	0.76	1.98	0.81	1.54	0.63	1.40	0.58
Dummy for member 65+	0.12	0.33	0.14	0.35	0.13	0.34	0.13	0.33	0.12	0.33	0.09	0.29
Husband's wage (HKD)	17734	15161	15806	10453	16937	13760	13107	8604	19845	15553	34033	26567
Number of Obs.	31272		7503		17655		14775		14132		2365	

Source: Hong Kong Census, 2001 and 2006.

Notes: The sample is restricted to married women aged 25 to 44 with at least one child aged 0 to 17, who live in places with 3 or 4 rooms. Low education is defined as having at most primary education, medium education as having more than a primary education but less than a college degree, and high education as having a college degree or a graduate degree.

Table 4. Placebo Tests: Reduced form

	Dependent Variable: Labor Force Participation					
	Married with Children 0-17		Married No Children 0-17		Low Edu, Wage husb <10000	
	OLS	Probit - ME*	OLS	Probit - ME	OLS	Probit - ME
Dummy for 4 rooms	0.045 (0.006)	0.049 (0.007)	-0.005 (0.007)	-0.004 (0.008)	0.022 (0.017)	0.023 (0.018)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Type FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of Observations	31272		11325		4984	

Notes: The sample is restricted to women aged 25 to 44 with at least one child aged 0 to 17. Demographic controls include age, age-squared, three dummies for educational attainment and spouse educational attainment, household size and indicators for the presence of children aged 0 to 5 and 6 to 17, the presence of a live-in parent aged above 65 years and log spouse income. Specification (6) is estimated for three groups of women: (1) married women with children (main sample), (2) married women with no children and (3) low-educated mothers whose husband earns less than 10,000 HK\$ per month. Robust standard errors reported.

* ME refers to Marginal Effects

Table 5. Structural Model of Labor Supply and the Decision to hire a FDW

	Sample											
	A. All women aged 25-44				B. Subsidized Sale Flats				C. Nonmovers			
	(1) Only LFP	(2) Only DW	(3) Both	Interaction coeff. (statistical sig.)	(1) Only LFP	(2) Only DW	(3) Both	Interaction coeff. (statistical sig.)	(1) Only LFP	(2) Only DW	(3) Both	Interaction coeff. (statistical sig.)
Constant	4.134 (0.398)***	-11.884 (0.713)***	-7.033 (0.501)***	0.717 ***	5.735 (0.868)***	-14.530 (1.602)***	-7.935 (1.124)***	0.861 ***	5.073 (0.646)***	-13.186 (1.153)***	-7.303 (0.824)***	0.810 ***
Youngest Child 0-5	-0.385 (0.018)***	0.345 (0.042)***	0.526 (0.022)***	0.567 ***	-0.397 (0.036)***	0.504 (0.106)***	0.614 (0.047)***	0.506 ***	-0.411 (0.025)***	0.375 (0.059)***	0.544 (0.031)***	0.579 ***
High education	0.209 (0.032)***	0.184 (0.068)***	1.124 (0.038)***	0.732 ***	0.224 (0.082)***	0.154 (0.211)	1.204 (0.090)***	0.826 ***	0.267 (0.046)***	0.259 (0.099)**	1.112 (0.054)***	0.586 ***
Mid education	0.207 (0.016)***	0.127 (0.049)***	0.833 (0.026)***	0.499 ***	0.205 (0.032)***	0.063 (0.105)	0.813 (0.051)***	0.545 ***	0.176 (0.021)***	0.149 (0.066)**	0.805 (0.035)***	0.481 ***
Ln(husb. Wage)	-0.335 (0.012)***	0.546 (0.020)***	0.211 (0.013)***		-0.409 (0.031)***	0.617 (0.056)***	0.208 (0.036)***		-0.359 (0.017)***	0.581 (0.029)***	0.222 (0.019)***	
Age	-0.060 (0.022)***	0.253 (0.038)***	0.193 (0.027)***		-0.107 (0.046)**	0.362 (0.084)***	0.254 (0.061)***		-0.097 (0.034)***	0.310 (0.060)***	0.214 (0.043)***	
Age square	0.001 (0.000)***	-0.004 (0.001)***	-0.003 (0.000)***		0.001 (0.001)**	-0.005 (0.001)***	-0.004 (0.001)***		0.001 (0.000)***	-0.004 (0.001)***	-0.003 (0.001)***	
Number of Children	-0.298 (0.017)***	0.440 (0.034)***	0.142 (0.027)***		-0.335 (0.041)***	0.503 (0.089)***	0.169 (0.066)***		-0.311 (0.023)***	0.495 (0.049)***	0.184 (0.040)***	
Household Size	0.090 (0.014)***	-0.330 (0.031)***	-0.240 (0.024)***		0.142 (0.034)***	-0.411 (0.077)***	-0.268 (0.057)***		0.110 (0.020)***	-0.407 (0.044)***	-0.296 (0.034)***	
Dummy Person 65+	0.043 (0.028)	0.247 (0.053)***	0.290 (0.039)***		-0.013 (0.059)	0.371 (0.120)***	0.358 (0.086)***		0.043 (0.038)	0.302 (0.076)***	0.345 (0.055)***	
More than 3 rooms		0.333 (0.016)***	0.333 (0.016)***			0.261 (0.035)***	0.261 (0.035)***			0.320 (0.022)***	0.320 (0.022)***	
Correlation coefficient	-0.263 (0.013)***				-0.301 (0.038)***				-0.253 (0.018)***			
Log-likelihood	-30279				-6928				-16660			
No. Observations	31272				7503				17655			

Notes: Model is estimated as a multivariate probit. Model is estimated separately for three groups of women: (A) mothers aged 25 to 44 who live in houses with 3 or 4 rooms (B) subset of (A) who live in government subsidized sale flats (C) subset of women that reported not having moved in the past 5 years. Robust standard errors in parenthesis. ***significance at 1% level, **significance at 5%, *significance at 10%.

Table 6. Consumer Surplus Estimates from the FDW Program (in HKD)

	Mean	Std. Dev.	Max
<i>All Women age 25-44, house 3-4 rooms</i>			
Consumer Surplus - lower bound	554.94	1848.461	28535.23
Consumer Surplus - higher bound	853.75	2843.786	43900.36
<i>Oldest Child Age 0-5</i>			
Consumer Surplus - lower bound	997.55	2472.402	28535.23
Consumer Surplus - higher bound	1534.7	3803.695	43900.36
<i>Oldest Child Age 6-17</i>			
Consumer Surplus - lower bound	270.17	1214.637	22153.92
Consumer Surplus - higher bound	415.64	1868.673	34082.95
<i>Low Education</i>			
Consumer Surplus - lower bound	85.638	638.4871	13225.99
Consumer Surplus - higher bound	131.75	982.2879	20347.68
<i>Medium Education</i>			
Consumer Surplus - lower bound	807.5	2137.059	19047.05
Consumer Surplus - higher bound	1242.3	3287.783	29303.16
<i>High Education</i>			
Consumer Surplus - lower bound	1977.6	3401.073	28535.23
Consumer Surplus - higher bound	3042.5	5232.42	43900.36

Notes: Simulations using model estimated in Table 5, panel A. Lower bound refers to the conversion 1 util = 6500 HKD, Upper bound refers to 1 util = 10,000 HKD. Low education is defined as having at most primary education, medium education as having more than a primary education but less than a college degree, and high education as having a college degree or a graduate degree.

Table 7. Micro-approach Diffs-in-Diffs estimate of the LFP effect of the FDW program

	Observed	Predicted w _n at 2001 level	Upper bound Predicted w _n at 1981 level	Lower Bound Predicted w _n at 1981 level
<i>All</i>				
Child 0-5	0.550	0.548	0.343	0.352
Child 6-17	0.551	0.552	0.478	0.480
Diffs-in-Diffs			0.132	0.124
<i>Low Education</i>				
Child 0-5	0.318	0.357	0.311	0.312
Child 6-17	0.473	0.462	0.446	0.446
Diffs-in-Diffs			0.030	0.029
<i>Mid Education</i>				
Child 0-5	0.652	0.634	0.373	0.384
Child 6-17	0.638	0.657	0.523	0.526
Diffs-in-Diffs			0.127	0.119
<i>High Education</i>				
Child 0-5	0.754	0.707	0.308	0.331
Child 6-17	0.748	0.738	0.469	0.479
Diffs-in-Diffs			0.130	0.116

Notes: Lower bound refers to the conversion 1 util = 6500 HKD, Upper bound refers to 1 util = 10,000 HKD. Low education is defined as having at most primary education, medium education as having more than a primary education but less than a college degree, and high education as having a college degree or a graduate degree.

APPENDIX

Table A1. Descriptive Statistics for the Sample used for the Diff-in-Diff Estimator: Married mothers age 25-44

Period	Hong Kong						Taiwan					
	78-81	85-87	89-93	94-98	99-02	03-06	78-81	85-87	89-93	94-98	99-02	03-06
Youngest Kid age 0-5	0.64	0.55	0.46	0.45	0.42	0.38	0.53	0.50	0.44	0.44	0.44	0.40
Age 25-29	0.27	0.21	0.12	0.09	0.07	0.07	0.31	0.28	0.22	0.18	0.15	0.13
Age 30-34	0.27	0.32	0.30	0.26	0.21	0.21	0.25	0.32	0.30	0.29	0.27	0.26
Age 35-39	0.22	0.30	0.33	0.36	0.37	0.33	0.23	0.25	0.30	0.30	0.33	0.32
Age 40-44	0.24	0.17	0.24	0.29	0.35	0.40	0.22	0.16	0.18	0.23	0.26	0.30
Low Education	0.66	0.52	0.42	0.31	0.23	0.16	0.78	0.59	0.42	0.25	0.12	0.06
Mid Education	0.32	0.46	0.55	0.64	0.70	0.73	0.20	0.38	0.54	0.70	0.81	0.83
High Education	0.02	0.02	0.03	0.05	0.07	0.11	0.02	0.03	0.04	0.05	0.07	0.11
LFP	0.39	0.42	0.41	0.44	0.49	0.54	0.37	0.48	0.51	0.55	0.58	0.61
Number of Obs.	6894	15098	33950	122380	102559	84206	14681	26141	43545	42429	30271	26035

Table A2. Prob. of married women 24-44 with mother-in-law or mother at home by country, education level, and year
(Net of age dummies; from Census Data)

	Taipei				
	All	Primary	Secondary	Post-Sec	College+
1980	0.304 (0.002)	0.267 (0.004)	0.317 (0.004)	0.310 (0.004)	0.343 (0.012)
1990	0.296 (0.002)	0.236 (0.004)	0.314 (0.004)	0.321 (0.004)	0.339 (0.012)
2000	0.323 (0.002)	0.242 (0.004)	0.346 (0.004)	0.342 (0.004)	0.330 (0.012)
No. obs:	TW =1286647				
	Hong Kong				
	All	Primary	Secondary	Post-Sec	College+
1980	0.269 (0.014)	0.221 (0.029)	0.300 (0.020)	0.191 (0.043)	0.178 (0.053)
1990	0.267 (0.015)	0.213 (0.030)	0.286 (0.019)	0.272 (0.042)	0.228 (0.052)
2000	0.257 (0.014)	0.190 (0.030)	0.292 (0.019)	0.228 (0.040)	0.180 (0.049)
No. obs:	HK=55081				

Source: Hong Kong data is from the 1980, 1990 and 2000 Census. Taipei data is from the 1980, 1990 and 2000 Taiwan Population Census.

Table A3. Type of care for children age 0-3, Taiwan

Year	Parents	Grandparents or Relatives	Nannies	Guest Worker	Daycare
1980	84.71	12.92	2.18	-	0.19
1990	72.93	21.88	5.01	-	0.17
2000	72.33	20.65	6.53	0.16	0.33
2003	69.65	22.35	7.41	0.13	0.46
2006	65.79	26.05	7.48	0.34	0.33

Source: Directorate-General Budget, Accounting and Statistics, Executive Yuan (Taiwan)

Table A4. Having Moved and the Likelihood of hiring a FDW

	Dep. Var: Dummy for FDW at Home			
	All		Only child aged 0-5	
	OLS	Probit	OLS	Probit
Moved in past 5 years	0.004 (0.005)	0.003 (0.004)	0.008 (0.015)	0.009 (0.015)
Demographic controls	Yes	Yes	Yes	Yes
Quarter Type FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
No. of Observations	22137		5945	

Notes: The main sample is restricted to women aged 25 to 44 with at least one child aged 0 to 17. The last two columns restrict the sample to women with only one child aged 0-5. Moved in past 5 years is a dummy variable that indicates if the household reported moving at least once in the past five years (only 70% of the sample answered this question). Demographic controls include age, age-squared, three dummies for educational attainment and spouse educational attainment, household size and indicators for the presence of children aged 0 to 5 and 6 to 17, the presence of a live-in parent aged above 65 years and log spouse income. Robust standard errors reported.

Table A5. Distribution of Number of Rooms

	Sample					
	All	Subsidized H.	Non-movers	Low Edu	Med Edu	High Edu
1-2 Rooms in Hhld.	0.12	0.04	0.12	0.18	0.08	0.03
5-6+ Rooms in Hhld.	0.21	0.17	0.17	0.10	0.25	0.49
3-4 Rooms- Our sample	0.67	0.79	0.71	0.72	0.67	0.49

Source: Census 2001 and 2006.

Notes: The sample is restricted to married women aged 25 to 44 with at least one child aged 0 to 17. Subsidized H. refers to women living in government subsidized flats and Non-movers refer to women who have not moved in the last 5 years. Low education is defined as having at most primary education, medium education as having more than a primary education but less than a college degree, and high education as having a college degree or a graduate degree.

Table A6. Structural Model of Labor Supply and the Decision to hire a FDW
 Estimation allowing complementarity to vary by ALL explanatory variables

	All women aged 25-44			
	(1) Only LFP	(2) Only DW	(3) Both	Interaction coeff. (statistical sig.)
Constant	5.078 (0.423)***	-6.777 (1.070)***	-8.656 (0.604)***	-6.957 ***
Youngest Child 0-5	-0.385 (0.018)***	0.365 (0.047)***	0.522 (0.023)***	0.542 ***
High education	0.234 (0.032)***	0.302 (0.072)***	1.090 (0.039)***	0.554 ***
Mid education	0.217 (0.017)***	0.183 (0.049)***	0.819 (0.027)***	0.419 ***
Ln(husb. Wage)	-0.359 (0.013)***	0.447 (0.034)***	0.245 (0.016)***	0.157 ***
Age	-0.101 (0.022)***	-0.001 (0.058)***	0.270 (0.032)***	0.373 ***
Age square	0.001 (0.000)***	0.000 (0.001)***	-0.004 (0.000)***	-0.005 ***
Number of Children	-0.301 (0.017)***	0.306 (0.062)***	0.157 (0.030)***	0.151 **
Household Size	0.094 (0.014)***	-0.190 (0.057)***	-0.258 (0.026)***	-0.161 **
Dummy Person 65+	0.058 (0.029)	0.203 (0.089)**	0.278 (0.046)***	0.017
More than 3 rooms		0.305 (0.038)***	0.340 (0.019)***	0.036
Correlation coefficient	-0.268 (0.013)***			
Log-likelihood	-30248			
No. Observations	31272			

Notes: Model is estimated as a multivariate probit. Robust standard errors in parenthesis.
 ***significance at 1% level, **significance at 5%, *significance at 10%.