

Hypergamy, Cross-boundary Marriages, and Family Behavior*

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December 17, 2012

Abstract

This paper theoretically and empirically studies cross-boundary marriages. We first characterize the assignment profiles and utility shares in a simple two-marriage-market model with cross-boundary marriage costs. Because of the gender asymmetry in evaluating individual attributes in the marriage market, there are more men from rich regions marrying women from poor regions than the reversal combination, displaying a geographic manifestation of hypergamy. With the decrease in cross-boundary marriage costs, more gender-asymmetric cross-boundary marriages erode the relative position of women in rich regions not only in the marriage market but also within the household. The theoretical prediction is then supported by our empirical analysis based on the cross-boundary marriages between Mainland China and Hong Kong (HK), using the quasi-experiments brought about by the 1997 handover of HK to Mainland China and the discrete quota changes of the One-way Permit that decreased cross-boundary marriage costs. We further find the Hong Kong women's disadvantaged position in the marriage market exerts an incentive effect on their labor market behavior. Finally, we find that cross-boundary marriages have led more HK women than men to migrate to North America. Our results, thus, show a chain of geographic manifestation of hypergamy.

JEL classification: F22, J12

Key words: One-way Permit, hypergamy, cross-boundary marriage, family behavior.

*Comments by Gary Becker and James Heckman are greatly appreciated. We thank Lena Edlund for valuable comments in the early stage of the study. We also thank seminar participants from the Labor Working Group Meeting at University of Chicago, Hong Kong University, and the University of Chicago-Renmin Symposium on Family and Labor Economics.

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1 Introduction

Cross-national or cross-boundary marriages are an understudied research topic. Although economists have studied the open goods market (international trade), open financial market (international finance), and open labor market (international labor migration) for hundreds of years, the open marriage market appears to be a new research topic in economics. However, cross-boundary marriages have been increasingly an important socioeconomic phenomenon. For example, in 2009, the number of international migrants under family reunion schemes accounts for about 35% of the total number of international migrants around the world (International Migration Organization, 2010). Cross-boundary marriages have constituted up to 35-50% of the newly registered marriages in Singapore and Hong Kong (HK) in recent years. Therefore, the topic on cross-boundary marriages deserves greater academic scrutiny.

The present paper both theoretically and empirically analyzes cross-boundary marriages. We first characterize the assignment profiles and utility shares in a simple two-marriage-market model with cross-boundary marriage costs. We assume that age is more important for women than for men in the marriage market when age is used to proxy for beauty or fecundity. In contrast, income or wealth is assumed to be more important for men than for women because men usually take the family financial responsibility in traditional societies. Under the assumption of gender asymmetry in evaluating individual attributes such as age and wealth in the marriage market, women in poor regions are more attractive to men in rich regions than men in poor regions to women in rich regions. This fact results in more men from rich regions marrying women from poor regions than the reversal combination when the cross-boundary marriage cost is not sufficiently high, displaying a geographic manifestation of hypergamy.¹

With the decrease in cross-boundary marriage costs, there are more gender-asymmetric cross-boundary marriages, which erode the relative position of women in rich regions not only in the marriage market but also within the household. Furthermore, the model predicts an incentive effect on women in rich regions induced by their disadvantaged position. Finally, we expect a repercussion effect on the marriage market in rich regions. As the well-being of the women in rich regions has deteriorated after the increase in cross-boundary marriages, they may migrate to other richer regions. We call it a repercussion effect that may reflect the chain effect of cross-boundary marriages.

We empirically test our theoretical predictions by investigating the cross-boundary marriage between Mainland China and HK, which serves as a good setting for our study.

¹The term hypergamy is used specifically in reference to a tendency among human cultures that females seek to pursue males who have higher status than themselves. It often manifests itself as females being attracted to men who are comparatively older and wealthier. The hypergamy analyzed in this paper is a tendency of women in poor regions marrying to men in the rich region. We thus call it as a geographic manifestation of hypergamy.

First, HK shares a similar social and cultural background with Mainland China. The primary language used in HK is Cantonese, which is also the language used in Guangdong, the Mainland province neighboring HK. However, HK had been colonized by the United Kingdom for ninety-nine years, which resulted in a huge economic gap between Mainland China and HK.² Therefore, the similarity in social and cultural backgrounds and the huge economic gap provide great incentives for Mainland women to marry up with HK men, and make HK women avoid marrying down with Mainland men.

Second, the increase in cross-boundary marriages between residents of HK and Mainland China was triggered by clearly identifiable events: the handover of HK to Mainland China in 1997 and the discrete increases in one-way permit (OWP) quotas. The handover greatly facilitated the interchange between Mainland and HK residents. Furthermore, the cross-boundary marriage behavior is strictly governed by the OWP scheme, which requires all Mainland spouses or children of HK permanent residents to obtain a OWP document before moving to HK for family reunion purposes.³ The daily quota of OWP was 75 in 1982, which increased to 105 in 1993, and then to 150 in 1995. Before 1996, it normally took eight to ten years for Mainland partners or children born in the Mainland to obtain a OWP. The waiting period went down to three to five years after 1995. Therefore, the handover and the discrete increases in OWP quotas serve as good quasi-experiments exogenously reducing cross-boundary marriage costs.

Third, the magnitude of the cross-boundary marriages is significant enough to change the fundamentals in the HK marriage market. Cross-boundary marriages account for almost half of all the marriages registered in HK in 2006 (Figure 1). Due to HK's superiority in public welfare, education, and medical systems, most of the Mainland partners and children have finally migrated to HK through the OWP scheme (Bacon-Shone et al., 2008). There were 855,116 new arrivals under the OWP scheme from the Mainland in 1990-2008, accounting for 12.23% of the total population in 2008 and 69.85% of the population growth during the same period.

Finally, the cross-boundary marriages are notable for the gender asymmetry on display: HK men marrying Mainland women outnumber the reversal combination seven times during the period of 1986-2006 (Figure 2). Therefore, the OWP arrivals have been dominated by females, leading to increasingly female-biased sex ratio in HK (Figure 3). This issue has drawn serious attention from the mass media, academic researchers, and the HK government (Bacon-Shone et al., 2008; HK Task Force on Population Policy, 2003).⁴

²For example, when HK was handed over to Mainland China in 1997, the per capital GPD was US\$27,055 in HK, whereas it was US\$770 in Mainland China and US\$1,800 in Guangdong (NBS, 1998).

³The OWP scheme is discussed in details in the Background section below.

⁴The other appealing fact of the HK experience that the labor migration from Mainland China is extremely restrictive. There was almost no labor migration before the Quality Migrant Admission Scheme in 2006 (Bacon-Shone et al., 2008). So the HK experience provides us a good setting to concentrate on the analysis of cross-boundary marriages.

Using the quasi-natural experiments brought by the handover and the discrete increases in OWP quotas, the present study constructs an difference-in-differences estimator to test the theoretical predictions. We use Taiwan residents as the comparison group which is good for several reasons. HK, Taiwan, and the Mainland share the same Chinese cultural background. Both HK and Taiwan traditionally source brides from the Mainland since the 1980s. Both regions experienced similar macroeconomic fluctuation such as the East Asian Financial Crisis during the 1990s. The immigration policy had been rather stable in Taiwan during the study period. We use the HK 1990 and Taiwan 1991 census years as the pre-treatment period and the HK 2001 and Taiwan 2000 census year as the post-treatment period.

Under this empirical strategy, we examine the reduced-form associations between regional changes in the residents' marital status, family structure and intrahousehold bargaining power and discrete changes in OWP quotas and the handover. The latter factors are used to proxy for exogenous decreases in cross-boundary marriage costs. The empirical results show that the increases in OWP quotas and the handover had bolstered the males' relative position in the marriage market and diminished that of the females. Specifically, for women, the currently-married rates and ever-married rates decreased, whereas the divorced-rates increased. More single women lived with children. Furthermore, wives are less likely to be household heads. The results are reversed for men.

We further explore the richness of the HK (by)-censuses (1991, 1996, 2001, 2006) and check the gender differential changes in marital status, family structure, intrahousehold bargaining, and labor market outcomes after the discrete changes in OWP quotas and the handover. The gains focusing on HK censuses are two folds. On the one hand, we are able to control for the time trend. On the other, there are detailed measures of labor market outcomes in HK censuses. The estimation results on marital status, family structure, and intrahousehold bargaining are consistent with those when we use Taiwan residents as a comparison group. In addition, we find that the increase in gender-asymmetric cross-boundary marriages induced by discrete changes in OWP quotas and the handover exert an incentive effect on HK women relative to men. Women are more likely to participate the labor force, to be employed, and to take a second job.

We finally use the US census 2000 and Canada census 2001 to examine the repercussion effect. Immigrants from Taiwan, Singapore, and South Korea are used as a comparison group, and immigration years before 1997 as the pre-treatment period. We find that emigrants in from HK have biased toward to females since 1997.

The results are strongly consistent with our theoretical model. Furthermore, as predicted by the model, we find that the changes are mainly concentrated on lowly educated group. Therefore, the empirical results have established the decrease in costs as the main cause for the drastic increase in cross-boundary marriages between Mainland China and HK. Meanwhile, the results contradict the alternative hypothesis that the boom of higher

female education has driven the rapid growth of cross-boundary marriages. Under this hypothesis, the change in marital status should concentrate on the highly educated females, and the intrahousehold bargaining power should tilt toward females with their increased educational attainment.

The present study explores a new topic on family behavior under an open marriage market in the literature. We mainly contributes to two strands of literature. The first strand of literature has to do with the role of hypergamy in the mating process and its consequences. Marriage patterns such as hypergamy have been studied extensively by economists (Becker, 1973, 1991; Bergstrom and Bagnoil, 1993; Browning, Chiappori, and Weiss, 2011; Cheung, 1972; Choo and Siow, 2006; Edlund, 1999, 2005, 2006a; Siow, 1998; Trivers, 1972; Zhang, 1995) as well as other social scientists. While studies outside economics focus on the role of social norm in hypergamy, economic theory regards it as an outcome of the specialization and exchange in the household production model (Becker, 1991; Lam, 1988). Many researchers have argued that sex preferences (Edlund, 1999), biological gender mating difference (Edlund, 2005, 2006a, 2006b; Siow, 1998; Trivers, 1972), and the enforcement of property rights in children (Cheung, 1972) have all contributed to it. Siow (1998) discusses the role of gender differential in fecundity in the spousal age gap, which can be regarded as a kind of hypergamy in terms of age. Edlund (2005) considers the surplus of women in urban areas to be a geographic manifestation of the general phenomenon of hypergamy in the marriage market.

The present study both theoretically and empirically contributes to this strand of literature. On the one hand, we theoretically incorporate hypergamic preference into a two-marriage-market model and explore its implications on the assignment profiles and utility shares. On the other hand, we systematically explore the consequences of hypergamy in the marriage market and provide the empirical linkage of marriage pattern to marriage formation and other family behaviors. As marriage-market institutions may be endogenously evolving with other markets, the empirical identification of the validity and consequences of hypergamy have largely remained unexplored. The HK experience provides a precious opportunity to empirically identify the socioeconomic implications of the hypergamic preference.

The second strand of literature is on the relationship between marriage-market conditions and family behaviors. Since gender-asymmetric cross-boundary marriages have directly changed the sex ratio in the HK marriage market, our study is closely related to the economic literature concerning the effects of sex ratio imbalance. Recently, a wave of new studies has examined the socioeconomic consequences of the changes in marriage-market conditions such as sex ratios (e.g., Angrist, 2002; Chiappori, Fortin and Lacroix, 2002; Brainerd, 2006; Edlund et al., 2008; Grossbard and Amuedo-Dorantes, 2007; Kvasnicka and Bethmann, 2007; Lafortune, 2007; Porter, 2007a, 2007b; Schmierer, 2010). The emergence of the literature on sex ratios may be due to two major reasons.

On the one hand, from the theoretical perspective, the sex ratio is a direct measure of the marriage-market condition. The sex ratio directly affects the intrahousehold resource allocation and can thus be used to test collective household behaviors such as intrahousehold resource allocation and labor supply (Becker, 1973; Grossbard-Shechtman, 1993; Chiappori, Fortin and Lacroix, 2002; Porter, 2007a, 2007b). On the other hand, from the policy perspective, the male-biased sex ratios, particularly in many Asian societies, have drawn increasing attention from government policy makers. Sen (1990) claims that “more than 100 million women are missing” due to the prevalent gender preference and gender selection in Asian societies.

Empirically, the recent literature on sex ratios has explored its variations induced by various sources. Brainerd (2006), Grossbard and Amuedo-Dorantes (2007), Kvasnicka and Bethmann (2007), Porter (2007a, 2007b), and Schmierer (2010) utilize large cohort shifts in fertility or mortality rates that altered sex ratios to study the effects of sex ratio imbalance. Chiappori, Fortin and Lacroix (2002) and Rao (1993) use the regional variations in sex ratios. Edlund et al. (2008) analyze the cross-region and cross-cohort variation in sex ratios induced by the One-child Policy in China. Angrist (2002) uses the variation in sex ratios induced by immigration flows to the United States in the early part of the 20th century. The literature has found far-reaching consequences of persisting sex ratio imbalance in the marriage and labor markets, and even within and cross-households.

The present study contributes to this strand of the literature by linking hypergamy, gender-asymmetric cross-boundary marriages, sex ratio imbalance, and family behaviors. The exogenous variation in sex ratios exploited by Angrist (2002), actually, is originated from the interaction between endogamous preferences within ethnic groups and the change in the migration volumes. The latter is mainly induced by the change in American immigration laws. The exogenous variation in sex ratios in our study comes from the interaction between hypergamic preferences that more women marry from poor regions to rich ones than men do and the decrease in cross-boundary marriage costs. The latter is induced by the change in the exit policy in the Mainland side and the handover. Furthermore, Angrist (2002) studies the effects of the change in ethnic group-specific sex ratios, while implicitly holding aggregate sex ratios constant. On the contrary, we analyze the change in the economy-wide change in sex ratios because more than 97% HK residents marrying to local ones or those from Mainland China. Finally, despite the burgeoning literature on sex ratios, most studies explore the consequences of male-biased sex ratios. On the contrary, the present study examines the consequences of female-biased sex ratios. Complementary to the literature, studying variations in sex ratios at the aggregate level and toward females can undoubtedly help us gain a full understanding of the relationship between marriage-market conditions and family behaviors.

More importantly, echoing Angrist (2002), the present study highlights the importance of virtue sex ratios affecting men’s and women’s family behaviors. To put the argument

in the context of HK, both the sex ratio at birth and the sex ratio of those residents born in HK have been stable and balanced in the past three decades. Due to the interaction between hypergamy and cross-boundary marriages, however, the sex ratio of the potential population from which HK men and women want to find spouses is severely biased toward females. We call the sex ratio of the potential population in the marriage market the virtue sex ratio. The increase in OWP quotas and the handover of HK to Mainland China have decreased the cost of cross-boundary marriages between the residents of Mainland China and HK, and thus have decreased the virtue sex ratio with respect to HK residents. Therefore, the present study casts doubt on the measurement of sex ratios by region and calls for caution in conceptually defining appropriate sex ratios.

The remainder of the present study is organized as follows. Section 2 presents the background of OWP scheme, cross-boundary marriages and the gender imbalance in HK, and discusses the spousal characteristics of cross-boundary marriages. Section 3 builds the theoretical model and derives testable predictions. Section 4 specifies our empirical strategy, and Section 5 discusses the data. Section 6 presents our main empirical results, and Section 7 reports the repercussion effects. Section 8 concludes.

2 Background

2.1 The One-Way Permit, Cross-Boundary Marriages, and Gender Imbalance in HK

Cross-boundary marriages have become an increasingly important element in marriages involving HK residents. Figure 1 shows the fraction of cross-boundary marriages in all marriages registered in HK from 1986 to 2006.⁵ We find that the ratio shot up from 2% in 1986 to 43% in 2006.⁶ These marriages are also notable for the gender asymmetry on display. HK men marrying Mainland women outnumber the reverse combination six to seven times. Figure 2 depicts the number of cross-boundary marriages registered in HK by residence of spouses from 1986 to 2006. Figure A1 in the web appendix shows the proportion of marriages registered in HK by residence of spouses from 1991 to 2006. We find that the combinations with the Mainland brides and HK grooms have dominated the reverse combination during the past two decades, although the combinations of HK bride and the Mainland groom had increased since 2000.

The sharp increase in cross-boundary marriages between the residents of the Mainland and HK had been triggered by a clearly identifiable event: the handover of HK to Mainland China in 1997. Furthermore, the cross-boundary marriage behavior in HK is strictly governed by exit policies of the Mainland authority in which the OWP is the

⁵The total number of cross-boundary marriages registered in Hong Kong by gender during the period of 1991 to 2006 was tabulated in Table A1 in the web appendix.

⁶Some cross-boundary marriages had been registered in Mainland China. But there is no aggregate statistics on the number of these marriages.

single most important one. Compared to lenient immigration policies for family reunion worldwide, extremely restrictive migration policies govern the residency of the Mainland Chinese in HK, even for spouses and children of HK permanent residents.

The Mainland authority implements the OWP to facilitate families with spouses and children residing in the Mainland to be reunited in HK while preventing the large volume of immigration to HK. The OWP is available to two groups: children of permanent HK residents with Certificate of Entitlement (CoE), and spouses and other dependents. The OWP stipulates that all Mainland spouses or children of HK permanent residents must obtain an OWP document to migrate to HK for purposes of reuniting with their family. The daily quota of OWP was 75 in 1982, went up to 105 in 1993, and then to 150 in 1995. Before 1993, the annual inflow of OWP arrivals was less than 30,000. In 1996, the number hit a record high of 61,179. Before 1993, it normally took eight to ten years for a Mainland partner or a child born in the Mainland to get an OWP; however, the waiting period decreased to three to five years after 1995. The shorter waiting period greatly reduced both the material and psychological cost, which in turn increased the number of cross-boundary marriages.

The new OWP arrivals have been a major driver of population growth in HK during the past two decades. Drawn by HK's superior public welfare, educational, and medical systems, most Mainland partners and children have finally immigrated to HK through the OWP scheme. So the new OWP arrivals constitute a lion's share of population growth in HK (Figure A2 in the web appendix). In fact, there were 855,116 new OWP arrivals from the Mainland during the 1990-2008 period, accounting for 12.23% of the total population in 2008, and 69.85% of the population growth during the same period. We also find two discrete jumps in the OWP arrivals coinciding with the two years when the OWP quotas increased from 75 to 105 in 1993, and further to 150 in 1995. Figure A3 in the web appendix depicts the number of OWP arrivals by the type of relatives in HK. It shows that about half of the arrivals have spouses and the other half have parents in HK.

The OWP arrivals induced by gender-asymmetric cross-boundary marriages have severely biased the sex ratio in HK. Although the sex ratio of the OWP arrivals with parents in HK has been almost balanced during the 1996-2006 period, the sex ratio of the OWP arrivals with spouses in HK severely biased toward females (Figure A4 in the web appendix). Given the large scale of cross-boundary marriages and of the inflow of OWP arrivals, the sex ratio of the HK population has also been severely biased toward females. Figure 3 shows that the sex ratio has experienced a monotonic decrease in the past decades. We find that the sex ratio decreased more dramatically after the increase in the OWP quota in 1995 and the handover of HK in 1997.⁷ We thus conclude that the

⁷We can further check the robustness of the relationship between gender-asymmetric cross-boundary marriages and the biased sex ratio in the HK population. Figure A5 in the web appendix shows that the sex ratio at birth has been rather stable and balanced in the past decades. Furthermore, Figure A6 confirms that the sex ratio for residents born in HK has also been stable and balanced, suggesting

imbalance in the sex ratio in HK is attributable to gender-asymmetric cross-boundary marriages between the residents of Mainland China and HK.

2.2 The Spousal Characteristics of Cross-Boundary Marriages

We have discussed the trend of cross-boundary marriages between the residents of Mainland China and HK, the OWP, and the relationship between gender-asymmetric cross-boundary marriages and the sex ratio imbalance in the HK population. Questions remain as to who are involved in cross-boundary marriages and why. Mainland Chinese in cross-boundary marriages cannot migrate to HK immediately after the marriage; hence we cannot access their information at the micro level. However, we can check the aggregate statistics about the spousal characteristics of cross-boundary marriages by residence type as reported by the HK Marriage and Records Office (CSD, 2007).

We check two types of spousal characteristics, that is, age and education. Table 1a summarizes the median age at marriage by sex and residence of spouses for all marriages registered in HK in 2006. Traditionally, Chinese husbands are, on average, two to three years older than their wives. This traditional protocol is confirmed by columns (1) and (4) with respect to the marriage type with HK (Mainland) brides and HK (Mainland) grooms. With regard to the marriage type with Mainland brides and HK grooms, husbands are, on average, nine years older than their wives (column (2)). In contrast, husbands are, on average, younger than their wives with respect to the marriage type with HK brides and Mainland grooms (column (3)).⁸ Table 1b tabulates the distribution of the educational attainments of grooms and brides who married in HK by residence of spouses in 2006. We find that cross-boundary marriages mainly involve individuals with low education: most of them do not have tertiary education.⁹

The aggregate statistics on the spousal characteristics in Tables 1a-1b clearly display a geographic manifestation of hypergamy. Although the motivation for cross-boundary marriage is multidimensional, the aggregate statistics show that, at least, age is an important factor. Given the huge population pool in the Mainland, HK males who are involved in cross-boundary marriages may want to source younger and more beautiful girls. This fact leads to the marriage of young women in the poor region with old men in the rich

that the sex ratio imbalance is not due to the biased emigration of local HK residents. Section 7 below finds that there are more females than males who have emigrated to North America since 1997. But the magnitude of the total emigrants is too small to change the sex ratio of the HK population.

⁸Figure A7 in the web appendix depicts the proportion of marriages registered in HK by residence of spouses and difference in age. Among the four marriage types, we find that the type with Mainland brides and HK grooms has the largest share of marriages with brides younger than grooms by at least five years. In contrast, the marriage type with HK brides and Mainland grooms has the largest share of marriages with brides older than grooms by at least five years.

⁹Figure A8 depicts the proportion of marriages registered in HK by residence of spouses and difference in educational attainment. Among the four marriage types, we find that the type with Mainland brides and HK grooms has the largest share of marriages with better-educated grooms. On the contrary, the type with HK brides and Mainland grooms has the largest share of marriages with better-educated brides.

region. This observation will be incorporated into our theoretical analysis when we model the cross-boundary marriages and derive testable predictions in the section below.

3 The Model

3.1 The Autarky Marriage Market

We begin with an autarky marriage market without migration which sets up a benchmark for our theoretical analysis. Denote the male and female traits as m and f , respectively. For simplicity, we assume uniform distributions for the male and female traits:

$$\begin{aligned} m &\sim [a, a + \delta], \\ f &\sim [b, b + \delta]. \end{aligned}$$

We further assume that singles consume their own "income" m and f , and marital output is

$$h(m, f) = mf + m + f. \quad (1)$$

The marital surplus mf is always positive and everyone wants to marry if he or she can. The marital output function is supermodular indicating complementarity of the male and female traits. The supermodular property can be rationalized by increasing returns in the household production function or household public goods (Lam, 1988; Weiss, 1997). This property yields a positive assortative matching, implying that

$$1 - F(m) = r(1 - G(f)), \quad (2)$$

where $F(\cdot)$ and $G(\cdot)$ are the accumulative distribution functions of the traits for males and females, respective; and r is the ratio of women to men. We assume that $r < 1$.¹⁰

Given the uniform distributions, the assignment profiles are linear and given by

$$m = rf + a + \delta - r(b + \delta) \equiv \phi(f) \text{ for } f \geq b \quad (3)$$

$$f = \frac{m}{r} - \frac{a + \delta}{r} + (b + \delta) \equiv \psi(m) \text{ for } m \geq m_0 = a + \delta(1 - r) \quad (4)$$

That is, all women are married and all men in the range $[a, m_0)$ are single. Figure 5 graphs the matching in the case of autarky marriage market. The lowest match is man m_0 and the woman b , and the highest match is man $a + \delta$ and woman $b + \delta$. One can see that m_0 rises with δ and declines with r .

When a man m is married to a woman f , we denote the shares for the man and

¹⁰Even though the sex ratio at birth is balanced, there is always a shortage of women in the marriage market. See the discussion in Siow (1998) and Edlund (1999).

woman as $u(m)$ and $v(f)$, respectively. $h(m, f) = u(m) + v(f)$, the shares satisfy

$$\begin{aligned} u(m) &= k^m + \int_{m_0}^m h_m(\phi(t), t) dt, \\ v(f) &= k^w + \int_b^f h_f(s, \psi(s)) ds, \end{aligned}$$

where

$$\begin{aligned} h_m &= f + 1, \\ h_f &= m + 1. \end{aligned}$$

Hence, making use of Equations (3)-(4), we have

$$u(m) = k^m + \int_{m_0}^m \left(1 + \frac{s}{r} - \frac{a + \delta}{r} + (b + \delta)\right) ds, \quad (5)$$

$$v(f) = k^w + \int_b^f (1 + rt + a + \delta - r(b + \delta)) dt. \quad (6)$$

The constants of k^m and k^w are determined by the condition that, because there are more men than women, the "last" married man should have no rent. Having assumed that singles consume their own "income," we set

$$k^m = m_0. \quad (7)$$

Hence the woman marrying m_0 reap all marital surplus of $m_0 b$, and

$$k^w = m_0 b + b. \quad (8)$$

We call $m_0 b$ as a "rent" that is enjoyed by all women because they are in the short side of the marriage market.

When more women are available and r increases, fewer men are single and m_0 declines. We then have

$$\frac{du(m)}{dr} = \frac{\partial u(m)}{\partial m_0} \frac{\partial m_0}{\partial r} - \int_{m_0}^m \left(\frac{s - (a + \delta)}{r^2}\right) ds > 0, \quad (9)$$

$$\frac{dv(f)}{dr} = b \frac{\partial m_0}{\partial r} + \int_b^f (t - (b + \delta)) dt < 0, \quad (10)$$

where $\frac{\partial u(m)}{\partial m_0} = -b$ and $\frac{\partial m_0}{\partial r} = -\delta$. That is, an increase in r reduces the utility of all women and raises the utility of all married men. Conceptually, there are two effects on the male's share. The first term measures the "extensive margin" effect because more

women decrease the proportion of single men in the marriage market. The second term measures the "intensive margin" effect because the rise in the sex ratio directly changes the male's share in marital output. This is a standard prediction in family economics.¹¹

3.2 The Attribute Function and Hypergamic Preference

Before going directly to analyze cross-boundary marriages, we first define the individual's attribute function carefully. To fix ideas, we define male i and female j 's attributes m and f such that

$$\begin{aligned} m_i &= \alpha_M age_i + \beta_M Y_i + \varepsilon_i, \\ f_j &= \alpha_F age_j + \beta_F Y_j + \varepsilon_j, \end{aligned}$$

where Y measures wealth and ε is a random shock to a person's pre-marital endowment. This simple formula imposes the same ordering in the two regions. So we can unambiguously rank men and women wherever they come from, and we also have positive sorting on this scale. The coefficients α and β can be different between any two regions such as Mainland China and HK. Imposing similar coefficients in the two regions may also make much sense and simplify matters. Importantly, α may be of opposite signs for men and women, and wealth may be more important for men than for women. For example, α_M may be positive because men gain experience when they age, whereas α_F be negative because beauty and fecundity decreases with age given a certain threshold.

Individuals from different regions may have different marital endowments. Men from poor regions, say, the Mainland, will be at the bottom of the male distribution because they have low Y . This is not necessary for Mainland women because wealth is less important for women than men. Indeed, Table 1a shows that age is an important factor for HK men to source Mainland women. If the cost of cross-boundary marriage is not sufficiently high, there exists a demand for Mainland brides in HK, in particular, for those young brides. In contrast, the demand for Mainland grooms should be lower than that for brides, resulting in a geographic manifestation of hypergamy.

The hypergamic preference in our paper, thus, originates from the specification of the gender-asymmetric attribute functions. Since our paper focuses on cross-boundary marriages, we take the gender asymmetric attribute functions as given. The specification of the attribute functions is consistent with our observed pattern of the spousal characteristics of cross-boundary marriages discussed in the proceeding section. The gender asymmetric attribute functions can be behaviorally justified in theoretical models such as Siow (1998).

¹¹See, e.g., Grossbard-Shechtman (1984), Becker (1991), and Chiappori, Fortin, and Lacroix (2001).

3.3 Cross-boundary Marriages

We now consider cross-boundary marriages between a rich region such as HK and a poor one such as Mainland China. We shall focus on the equilibrium outcomes in HK assuming that the effects on the Mainland are negligible so all post immigration patterns in Mainland China are maintained. Concerning HK we shall require that the outcome following immigration is stable. We therefore apply the principle that the aggregate marital output in HK is maximized (Koopmans and Beckmann, 1957; Shapley and Shubik, 1972).

Based on the gender-asymmetric attribute function and the huge income gap between HK and Mainland China, we make the following assumptions to simplify our analysis: (1) $r^h = r^c = r < 1$; (2) $a^c = b^c = 0$; (3) $a^h > b^h > 0$; (4) the population of men in HK is normalized to 1 and of women in HK to r , and there are σ men and $r\sigma$ women in China, where $\sigma > 1$. The superscripts h and c denote the rich region (HK) and the poor one (Mainland China), respectively. We note that δ is the same in both regions and for both genders. So, all the four distribution are *linear shifts of each other*.

We notice that the marital output of couples can be reduced to a function of the husband's quality. Let us first construct a curve for the marital output of original local couples, starting from the top. Stability of local marriages requires positive assortative mating implying $f = \frac{m}{r} - \frac{a+\delta}{r} + (b + \delta)$ (Equation (4)). Then we can eliminate f and calculate output of the local marriage involving both HK residents for each m as

$$\begin{aligned} G_l(m) &= m + f + mf \\ &= m + (1 + m)\left(\frac{m}{r} - \frac{a^h + \delta}{r} + (b^h + \delta)\right). \end{aligned} \quad (11)$$

We can then construct the output of the cross-boundary marriage involving a HK man and a Mainland woman as

$$\begin{aligned} G_c(m) &= \omega(m + \tilde{f})m + (1 - \omega)(m + \tilde{f} + m\tilde{f}) - (\tilde{f} + \tilde{m} + \tilde{m}\tilde{f}) \\ &= m + (1 - \omega)m\tilde{f} - \tilde{m}(1 + \tilde{f}) \end{aligned}$$

where \tilde{m} and \tilde{f} denote Mainland men and women, and ω the waiting time.¹² There are two kinds of cost for cross-boundary marriages. One is the lost of marital surplus because of the waiting time ($\omega m \tilde{f}$), and the second is the opportunity cost to compensate for the lost marital output in the Mainland side ($\tilde{f} + \tilde{m} + \tilde{m}\tilde{f}$).

We start from the top and use positive assortative matching in HK to write \tilde{f} as a

¹²The total time after marriage is normalized to 1.

function of m ,

$$\begin{aligned} r\sigma\left(\frac{\delta - \tilde{f}}{\delta}\right) &= \frac{a^h + \delta - m}{\delta}, \\ \tilde{f} &= \delta + \frac{m - a^h - \delta}{r\sigma}. \end{aligned}$$

We shall also need to use the assignment in China to eliminate \tilde{m} . We have $\tilde{m} = r\tilde{f} + \delta(1 - r)$ (Equation (3)). Hence

$$\begin{aligned} G_c(m) &= m + (1 - \omega)m\left(\delta + \frac{m - a^h - \delta}{r\sigma}\right) \\ &\quad - \left(r\left(\delta + \frac{m - a^h - \delta}{r\sigma}\right) + \delta(1 - r)\right)\left(1 + \left(\delta + \frac{m - a^h - \delta}{r\sigma}\right)\right). \end{aligned}$$

We conjecture an equilibrium in which there exists m_2 , m^* , \bar{m} and m_1 with $a^h + \delta > m_2 > m^* > \bar{m} > m_1 \geq a^h$. The values of m_2 , m^* , \bar{m} and m_1 are cutoff points defined as follows. For men $m \in (m_2, a^h + \delta]$ marriages are local marriages with original spouses as in the case of autarky marriage market; for $m \in (m^*, m_2]$ and $m \in (m_1, \bar{m}]$ all couples are new marriages with Mainland women; for $m \in (\bar{m}, m^*]$ men engage local marriages with local women released by the men in $(m^*, m_2]$; the remaining men $m \in [a^h, m_1]$ are single.

This structure is quite intuitive because marrying foreign woman is costly. High local men already have a good wife and are unwilling to pay the cost. Low local men cannot afford foreign women and, instead, marry local displaced women who are cheaper, if they are available. Men at the bottom remain single because no local woman is available and they cannot afford the cross-boundary marriage cost. Below we discuss the output of the marriages for men in each range, and then analytically pin down the optimal m_2 , m^* , \bar{m} and m_1 .

Men in the top range of $m \in (m_2, a^h + \delta]$ marry local women as in the case of autarky marriage market. The marital output is defined in Equation (11). Men m in the range $(m^*, m_2]$ marry Mainland women and the marital output is

$$\begin{aligned} G_{c1}(m; m_2) &= m + (1 - \omega)m\left(\delta + \frac{m - m_2}{r\sigma}\right) \\ &\quad - \left(r\left(\delta + \frac{m - m_2}{r\sigma}\right) + \delta(1 - r)\right)\left(1 + \left(\delta + \frac{m - m_2}{r\sigma}\right)\right). \end{aligned}$$

Positive assortative matching implies that man m in the range $[\bar{m}, m^*]$ receives the replaced local wife of man $m_2 - m^* + m$. Then we have the following identity

$$m^* - \bar{m} = m_2 - m^*.$$

The marital output for a man $m \in [\bar{m}, m^*]$ who marries the replaced local wife of $m_2 -$

$m^* + m$ is

$$G_r(m; m_2, m^*) = m + (1 + m) \left(\frac{m_2 - m^* + m}{r} - \frac{a^h + \delta}{r} + (b^h + \delta) \right).$$

Note that

$$G_r(m; m_2, m^*) = G_l(m) + (1 + m) \frac{m_2 - m^*}{r},$$

implying that $G_r(m; \bar{m}, m^*) \geq G_l(m)$. That is, the entry of foreign women allows some local men to obtain better wives than they would otherwise have. The man in the range $(m_1, \bar{m}]$ also marries Mainland women and the marital output is

$$\begin{aligned} G_{c2}(m; m_2, m^*, \bar{m}) &= m + (1 - \omega)m \left(\tilde{f}_1 + \frac{m - \bar{m}}{r\sigma} \right) \\ &\quad - \left(r \left(\tilde{f}_1 + \frac{m - \bar{m}}{r\sigma} \right) + \delta(1 - r) \right) \left(1 + \left(\tilde{f}_1 + \frac{m - \bar{m}}{r\sigma} \right) \right), \end{aligned}$$

where $\tilde{f}_1 = \delta + \frac{m^* - m_2}{r\sigma}$. Finally, for men in the range that $m \in [a^h, m_1]$, they still remain single.

Using the identity $m^* - \bar{m} = m_2 - m^*$ to substitute out m^* , the aggregate marital output is then given by

$$\begin{aligned} S &= \int_{a^h}^{m_1} dm + \int_{m_1}^{\bar{m}} G_{c2}(m; m_2, \bar{m}) dm + \int_{\bar{m}}^{\frac{m_2 - \bar{m}}{2}} G_r(m; m_2, \bar{m}) dm \\ &\quad + \int_{\frac{m_2 - \bar{m}}{2}}^{m_2} G_{c1}(m; m_2) dm + \int_{m_2}^{a^h + \delta} G_l(m) dm. \end{aligned} \quad (12)$$

Because every stable matching has to maximize the aggregate marital output (Koopmans and Beckmann, 1957; Shapley and Shubik, 1972), we are able to pin down the optimal m_1 , \bar{m} , and m_2 by maximizing S in Equation (12). Since $m^* = \frac{m_2 - \bar{m}}{2}$, we can fully characterize the assignment profiles with cross-boundary marriages.

We defined the equilibrium derived above as the interior solution to maximize the aggregate marital output with cross-boundary marriages because all optimal $m_2, m^*, \bar{m}, m_1 \in (a^h, a^h + \delta)$. Figure 6 graphs the matching profile in the case of interior solution. Comparing to the case in the autarky marriage market of Figure 5, we find that all women still get married and some men remain single. But some women in the low tail of the distribution of the attribute are "pushed down" and get married to HK men who have lower quality than their original spouses in the autarky marriage market. As for men, more men get married than in the case of autarky marriage market. It is noted from Figure 6 that m_0 who was the last married man in the autarky marriage market now gets married to a replaced HK woman who has better quality than the original one of b^h .

It is possible to have corner solutions that maximize the aggregate marital output with cross-boundary marriages. Specifically, there are two corner solutions. The first one is a

corner solution with cross-boundary marriages. When the waiting period is sufficiently short, the HK men can cream the best Mainland women given the large population. In this case, $\bar{m} = m_1 = a^h$ and $m^* - a^h \leq m_2 - m^*$. Figure 7 graphs the matching profile in this case. All HK men get married and some HK women remain single.

The second one is a corner solution in which cross-boundary marriages do not occur. When the waiting time is sufficiently long such that $G_c(a^h + \delta) \leq 0$, there is no cross-boundary marriages. The two-marriage-market model is degenerated to the autarky marriage market case. Therefore, the second case is identical to the autarky marriage market. The matching profile is shown in Figure 5 as we discussed in the proceeding section.

So we have a total of three cases in the two-marriage-market model: the corner solution without cross-boundary marriages (hereafter, autarky marriage market), the interior solution with cross-boundary marriages (hereafter, interior solution), and the corner solution with cross-boundary marriage (hereafter, corner solution). We tabulate assignment profiles in the three cases as follows.

Table: Assignment profiles in autarky marriage market, interior solution, and corner solution

	Autarky	Interior solution	Corner solution
Range of traits	Hong Kong men		
$(m_2, a^h + \delta]$	local women	original local women	original local women
$(m^*, m_2]^1$	local women	Mainland women	Mainland women
$(m_0, m^*]$	local women	replaced local women	
$(\bar{m}, m_0]$	single	replaced local women	
$(m_1, \bar{m}]$	single	Mainland women	
$[a^h, m_1]$	single	single	
Range of traits	Hong Kong women		
$(f(m_2), b^h + \delta]^2$	local men	original local men	original local men
$(f(m^*), f(m_2)]$	local men	replaced down	replaced down or single
$[b^h, f(m^*)]$	local men	replaced down	

1: The values of m^* and m_2 in the case of the interior solution differ from those in the case of the corner solution. In the corner solution, $m^* = a^h$.

2 : $f(\cdot)$ is the assignment function in the case of autarky marriage market.

The comparative static analysis of the matching profile with respect to a modest decrease in the waiting time, therefore, parallels the comparison of matching profiles between the autarky marriage market and the interior solution case (Figures 5 vs. 6). When the waiting time decreases to a sufficiently low level, the matching profile may change to that in corner solution (Figure 7). We summarize our result in the following proposition on the relationship between waiting time and the matching profile.

Proposition 1 *When the waiting time decreases to a modestly low level, there are gender-asymmetric cross-boundary marriages involving Mainland brides and HK grooms. Compared to the autarky marriage market, more HK men get married. Some HK women in the low tail of the distribution of HK women are replaced by Mainland women. These women have to marry HK men in the lower tail of the distribution of HK men than those in the autarky marriage. When the waiting time decreases to a sufficiently low level, more HK women in the low tail of the distribution are replaced by Mainland women and some of them remain single.*

We then discuss the utility shares after cross-boundary marriages. Comparing to the case of autarky marriage market, all women lose and all married men gain. But the gains or losses are different for persons located differently at the distribution. For women in the top range of $(f(m_2), b^h + \delta]$, they marry the same persons as in the autarky marriage market. But they lose the "rent" in Equation (8) because women are no longer at the short side of the marriage market. The total welfare for women in the low range of $[b^h, f(m_2)]$ decrease more than women in the top range. In addition to the rent, their total welfare loses because they marry inferior men than their partners in the case of the autarky marriage market. In contrast, men in the top range of $(m_2, a^h + \delta]$ reap the rent. For men in the range $(m_0, m_2]$, besides the rent, their utility shares increase because they marry better women. Furthermore, the originally single men in the range $(m_1, m_0]$ get married. When the waiting time decreases to a sufficiently low level, we arrive at the case of the corner solution. In this case, all men gain because they all get married. Furthermore, some women in the bottom of the distribution become single. They lose the most among all HK residents. We summarize the discussion in the following proposition.

Proposition 2 *When the waiting time decreases to a modestly low level, all women lose their utility shares whereas all married men gain utility shares. Women in the low tail of the distribution lose more than those in the high tail, and married men in the low tail of the distribution gain more than those in the high tail. When the waiting time decreases to a sufficiently low level, all men get married. All men gain. Women in the bottom of the distribution who become single lose the most.*

It is noted that we have made the following simplifications in building our theoretical model. (1) There is no search friction and the marriage matching is snapshot. (2) We assume transferable utility, and there is only one consumption good. (3) We ignore potential labor market gains for the Mainland brides. Positive assortative matching results only from the consumption of household public goods or increasing returns in the household production function. (4) We focus on the cross-boundary marriage type of HK men and Mainland women and neglect the marriages of HK women and Mainland men.

The first two assumptions are used only for analytic simplification. The latter two are based on socioeconomic realities in HK. First, the labor force participation rates of

the Mainland brides have been as low as 20% after they migrate to HK (Bacon-Shone et al., 2008). Moreover, they have to wait several years before the migration. Therefore, the gains from the labor market should be very low for them. Second, as we discussed in the Background section, HK men marrying Mainland women outnumber the reverse combination seven times during our study period. So we focus on the analysis of HK men marrying Mainland women. The analysis actually depends on parameters of a^h , b^h , σ , and δ . When the gap between a^h and b^h is sufficiently small and the waiting period is short enough, there may exist a mixed equilibrium with some HK women marrying Mainland men.

3.4 Testable Implications

Despite these simplifications, the model helps us analytically pin down the basic matching pattern with cross-boundary marriages. Moreover, it derives testable predictions that guide us to empirically examine demographic and economic consequences of the increase in cross-boundary marriages. These predictions also differentiate our theory from alternative ones in accounting for the increase of gender-asymmetric cross-boundary marriages. The differentiations make distinct policy implications between our model and alternative hypotheses.¹³

The major alternative factor explaining the rapid growth of cross-boundary marriages is the boom of higher female education. Women's education attainments have experienced rapid growth in both developed and developing countries (Goldin, Katz, and Kuziemko, 2006; Chiappori, Iyigun, and Weiss, 2009; Pitt, Rosenzweig, and Hassan, 2012; Becker, Hubbard, and Murphy, 2012). If the labor market becomes more favoring women, especially those with higher education, more women will pursue higher education. Thus, women should have more intrahousehold bargaining power because they have more outside options. If the change in social norms that regulate the intrahousehold resource allocation lagged behind the boom, higher educated women may prefer being single to marriage. Thus, men in rich regions may shift to poor ones to source brides. These men still prefer marriage because the traditional intrahousehold bargaining still tilts towards them. Kawaguchi and Lee (2012) posit this story and use it to explain the increase in gender-asymmetric cross-boundary marriages in Japan, South Korea, Taiwan, and Singapore since early 1990s. This is a legitimate logic, and the rapid increase of higher female education has been one of the major socioeconomic changes in these regions during the past two decades.

Our model, however, generates testable predictions that are in sharp contrast to

¹³We use the HK census data to conduct our empirical analysis. Because the Mainland spouses of the HK residents in the new marriages are not able to migrate to HK, they are not enumerated in the census. Therefore, we are not able to structurally estimate our model. We instead carry out the reduced-form estimation to test the model predictions by using the handover and increase in OWP quotas as natural experiments to reduce the cross-boundary marriage cost.

the boom hypothesis in explaining the increase of gender-asymmetric cross-boundary marriages. The first prediction is directly derived from Proposition 1:

corollary 1 *With the decrease in cross-boundary marriage costs and the increase in cross-boundary marriages, the change in the marital status focuses on the group with low socioeconomic status (SES).*

Following the boom hypothesis, the change in the marital status should focus on the highly educated group with high SES.

We then derive the second prediction directly from Proposition 2.

corollary 2 *The intrahousehold bargaining power tilts towards men after the decrease in the cost and the increase in cross-boundary marriages.*

In contrast, the boom hypothesis predicts increases in the bargaining power in the women's side because they have more outside options with the increase in female educational attainments. It is noted that, although Proposition 2 states that low SES women lose the most, Corollary 2 does not state that these women lose more intrahousehold bargaining than the high SES ones do. The reason is that these women marry men with lower quality in the interior solution than those in the case of the autarky marriage market. The superiority of relative high SES to their husbands comparing to that in the case of the autarky marriage market helps them gain some intrahousehold bargaining power relative to their husbands. In contrast, the women with high SES marry the same men as in the autarky marriage market.

As predicted by theories in family economics (Becker, 1991), the change in the relative positions both in the marriage market and within the household between men and women will also change their relative incentives in the labor market. From here, we derive our third corollary.

corollary 3 *The gender-asymmetric cross-boundary marriages induced by the decrease in the cost will change men's and women's incentives in the labor market. In particular, the female labor force participation rate increases relative to men with the increase in cross-boundary marriages. The incentive effects are larger for women with low SES than those with high SES.*

We note that the boom hypothesis also predicts an increase in female labor force participation rate. This is a cause but not the consequence of the cross-boundary marriages under the hypothesis. However, Corollary 3 is different from the boom hypothesis in at least two aspects. First, the increase in female labor force participation rate in the boom hypothesis is due to the improvement in the labor market in favor of women, especially those with higher education. Corollary 3 states that the female labor force participation

increases even in the absence of the improvement in the labor market. Second, Corollary 3 concludes that the labor force participation rates increases more for low SES women because they lose more utility shares after the cross-boundary marriages than the high SES women. The boom hypothesis makes the opposite predictions.

So far, we have focused on the two-marriage market case. We now consider Hong Kong as a "more" open marriage market in the sense that HK residents could marry those living in more developed regions. In this case, we expect a repercussion effect of cross-boundary marriages. As the well-being of local female residents has deteriorated after the increase in cross-boundary marriages, women would be more likely to leave Hong Kong for other developed economies such as Canada and the US. Therefore, we may observe a chain of geographic manifestation of hypergamy. From here we derive the fourth corollary.

corollary 4 *The decrease in the cost and the increase in gender-asymmetric cross-boundary marriages has a repercussion effect on the HK marriage market. The increase in cross-boundary marriages could bias emigrants from Hong Kong toward more females to the US and Canada. The repercussion effect should be larger for lower SES women than higher ones.*

The repercussion effect can also be derived from the boom hypothesis. However, in contrast to Corollary 4, the boom hypothesis expects a larger effect for high SES women than low ones.

The propositions and corollaries are empirically tested in following sections. We discuss the public policy implications of these propositions and corollaries in the last section when they are empirically verified.

4 Empirical Framework

To empirically examine the theoretical predictions, we present both descriptive time-series and formal econometric evidence. The descriptive time-series evidence is a set of coincident turning points in the increase of OWP quotas and the currently-married rate, ever-married rate, and divorced and not-remarried rate, among other indicators, for male and female HK residents, respectively. The formal econometric analyses involve cross-region, cross-time, cross-gender and cross-educational variations in the differential treatments of the increase in OWP quotas and the handover. With all the necessary controls, estimating the effects of policy changes and the handover suggests a causal relationship between the decrease in cross-boundary marriage costs and demographic and economic outcomes in HK because the OWP directly reduces the cost, even as the handover could also affect it.

Specifically, our basic regression equation is a difference-in-differences (DD) estimator:

$$Y_i = \alpha_0 + \alpha_1 HK_i + \alpha_2 T_i + \alpha_3 HK_i * T_i + X_i \alpha_4 + \varepsilon_i \quad (13)$$

where the dependent variable Y measures the outcome for individual i . We analyze two categories of dependent variables measuring the individual’s marital status and family structure. All dependent variables are discussed in detail in the next section. We use the Taiwan residents as a comparison group in estimating Equation (13). So the independent variable HK equals one if the individual is a HK resident, whereas it equals zero if she is from Taiwan. We use T to indicate the post-treatment period. It equals one if the individual was surveyed in HK census 2001 or Taiwan census 2000. If she was surveyed in HK census 1991 or Taiwan census 1990, it equals zero. X is a vector of variables measuring the individual’s characteristics such as age and schooling years. ε is an error term. We estimate Equation (13) for the male and female subsamples, respectively.

Our main interested coefficient is α_3 . The estimated α_1 and α_2 pick up the regional and time period differences in outcomes. So α_3 measures the cross-regional and cross-time changes in outcomes that are driven by changes in gender-asymmetric cross-boundary marriages. The latter was induced by the discrete increase of OWP quotas and the handover of HK to Mainland China in 1997.

The estimated effects of the decrease in cross-boundary marriage costs on the marital, intrahousehold, and labor market outcomes, α_3 , provide us direct tests of the propositions and corollaries stated in the section above. For example, in order to test Proposition 1, we use the marital status indicators as dependent variables (e.g., being currently married). Proposition 1 then predicts that α_3 is positive for males and negative females. We test Proposition 2 and other corollaries using other measures for marital, intrahousehold, and labor market outcomes.

The identification of α_3 invokes the standard assumption of the DD estimator. That is, the coefficient of α_3 should be zero without the discrete change in the OWP quotas and the handover (Angrist and Krueger, 1999). In other words, conditional on the observables, the HK and Taiwan local residents should share a same time trend of the change in marriage behaviors. This is, admittedly, a strong assumption. But we believe the identification assumption is plausible in our study context.

Taiwan residents serve as a good comparison group for HK residents. First, Taiwan, HK, and the Mainland share the Chinese cultural background. Second, Mainland China has been the dominant region for both Taiwan and HK citizens to source brides. Third, Taiwan and HK experienced similar macroeconomic fluctuation during the 1990s such as the 1997 East Asian Financial Crisis. Finally, the Taiwan government did not change marriage immigration policies during the 1990s.¹⁴

The endogeneity in the implementation of policies in quasi-experiment studies addressed by Besley and Case (2000) may be less of a concern in our study. As discussed in the Background section, the OWP is controlled and implemented by the Mainland

¹⁴The Taiwa government strengthened its immigration policies to discourage marriage immigration in 2004 (Kawaguchi and Lee, 2012).

authority. Therefore, policy changes in the OWP should be plausibly exogenous to social and economic factors in HK. The 1997 handover of HK to Mainland China had been stipulated in The Convention for the Extension of HK Territory in 1898 and was scheduled in the Sino-British Joint Declaration in 1984. Therefore, it is unlikely that there is an endogenous choice of the discrete changes in OWP quotas and the handover.

Despite factors favoring our identification strategy, we further explore the richness of the four waves of HK (by)-censuses (1991, 1996, 2001, 2006), and estimate the following regression equation:

$$Y_{iac} = \beta_0 + \beta_1 female_{iac} + \beta_2 T_{iac} + \beta_3 female_{iac} * T_{iac} + X_{iac} \beta_4 + \tau_{ic} + \zeta_{ia} + \nu_{iac}, \quad (14)$$

where i , a , and c index individual, age, and census, respectively. The dependent variable Y_{iac} measures the outcome for individual i at age a in census year c . The independent variable $female$ measures the individual's gender. It equals one if the individual is a female; otherwise, it equals zero. T is equals one if the census year is 2001 or 2006; otherwise, for individuals surveyed in 1991 or 1996, it equals 0. T equals one indicating the post-treatment period.¹⁵ X is a vector containing control variables. τ_{ic} and ζ_{ia} measure age and census year, respectively. ν_{iac} is the error term.

We are interested in the estimated coefficient of β_3 in Equation (14). The estimated β_1 and β_2 pick up the gender and time period differences in the individual outcomes. The estimated β_3 thus measures the changes in the gender differences in outcomes across the change in OWP quotas and the handover. The basic idea behind estimating Equation (14) is to observe successive cohorts of the same age for examining whether cross-gender and cross-cohort changes in the marriage and labor market behaviors are related to the cross-cohort changes in gender-asymmetric cross-boundary marriages, which were induced by the discrete increase of OWP quotas and the handover.

The identified causal effects of the decrease in cross-boundary marriage costs on the gender differences in marital, intrahousehold, and labor market outcomes, β_3 , provide us robust tests for the propositions and corollaries. For example, we can use a dependent variable of being currently married to test Proposition 1. We expect the estimated β_3 to be positive in this regression equation.

Comparing to Equation (13), the gains from estimating Equation (14) are three folds. First, we are able to control for the time trend because we have two periods before the treatment. This is valuable in quasi-experimental studies using the DD estimator (Meyer,

¹⁵As discussed above, the increase in OWP quotas and the handover of Hong Kong to China in 1997 sever as quasi-natural experiments in reducing the cost of cross-boundary marriages. We classify the census year 1996 as the pre-treatment period. Although the number of OWP quotas increased to 150 in 1995, the local marriage market in 1996 was unlikely to be affected by the 1995 policy relax as it would take some time to generate any visible impacts. The Hong Kong residents may need some time to find Mainland Chinese spouses. Thus, the effect of cross-boundary marriages may lag one or two years to take place.

1995; Angrist and Krueger, 1999). Second, we can estimate Equation (14) using the highly and lowly educated sample, respectively.¹⁶ By doing so, as discussed in the theoretical section, we are able to empirically distinguish our theory from the boom hypothesis in explaining the major behavioral motivation for the increase in cross-boundary marriages. Third, in contrast to the Taiwan census, the HK census contains rich information on the individual's labor market outcomes. We then estimate Equation (14) using many labor market outcomes as dependent variables. Therefore, we can examine the precondition for the alternative boom hypothesis that the labor market became favoring females during the 1990s. Meanwhile, as discussed in the section above, we are able to check the incentive effects of the gender-asymmetric cross-boundary marriages on the labor market behaviors of HK residents. The downside of estimating Equation (14) is that we cannot estimate the treatment effects on HK males and females separately. We estimate the differential treatment effects across gender.

In summary, guided by the theoretical model, the objective of our empirical analysis is to systematically examine the general pattern of the changes in the marriage market, intrahousehold, and labor market behaviors between male and female HK residents, and to relate the change pattern to the decrease in cross-boundary marriage costs. The latter was induced by the increase in the number of OWP quotas and the handover. Although strong identification assumptions are involved in estimating both Equations (13) and (14), our empirical analysis renders us an opportunity to test a general theoretical model on cross-boundary marriages and to distinguish our model from an alternative in account for the increase in cross-boundary marriages.

5 The Census Data and Graphic Analysis

To perform the empirical analysis, we draw on comprehensive census data sets from HK and Taiwan. This section describes the census data and presents a graphic analysis.

5.1 The HK Censuses: 1991, 1996, 2001, and 2006

We first derive our data from the 1991, 1996, 2001, and 2006 HK population censuses or by-censuses. HK conducts a population census once every ten years and a one-tenth by-census in the middle of the intercensal period. We draw on 5% samples from the 1991 and 2001 censuses and 50% samples from the 1996 and 2006 one-tenth by-censuses. Thus, each of the four samples contains 5% of the HK population in the census or by-census year. In forming these four samples, actions have been taken such that all residential quarters have an equal probability of selection by the HK Census and Statistics Department. The censuses contain rich information such as demographic characteristics, family structure, and labor-market behaviors.

We restrict our sample to HK residents who were born in HK. Most of the immigrants

¹⁶HK has adopted the British education system, which is substantially different that in Taiwan. So we do not make the distinction in estimating Equation (13).

in HK during the past two decades have been through cross-boundary marriages between the residents of Mainland China and HK. Cross-boundary marriages are endogenous outcomes; hence, including immigrants through cross-boundary marriages may generate a selected sample. Furthermore, the sample including these immigrants is truncated because some Mainland partners of HK residents have not migrated to HK at the census survey time.

Tables 2a-2b report the descriptive statistics based on the four waves of HK censuses (or by-census) by gender and by census. We examine the effects of cross-boundary marriages on a wide range of socioeconomic outcomes of HK residents. We first focus on the marital status of local HK residents, for which there are three variables: currently-married, ever-married, and separated or divorced. As stated in Proposition 1 in the theoretical section, the marital status should be directly affected by cross-boundary marriages.

We use two dummy variables to measure family structure. The first dummy variable indicates whether the adult is the head of the household. Defined by the census manual, "the head of a household is the person acknowledged by members of the household to make major decisions affecting the household." This variable is thus used to measure the bargaining power within the household. We define this variable only on married couples both of whom were born in HK. Because by-census 2006 codes household head differently from other ones, we drop this by-census in our analysis with respect to household head.¹⁷ The second one indicates whether the adult is divorced and living with children.

We use four variables to measure a HK resident's labor market outcomes: labor force participation, employment status, wage, and whether the individual holds a second job. We include some control variables in all of our empirical specifications: age, age square, educational years.

5.2 Taiwan Censuses: 1990 and 2000

We use Taiwan residents as a comparison group to perform the DD estimation. Therefore, we supplement the HK censuses with the Taiwan censuses. Like HK, Taiwan conducts a population census once every ten years. The two recent censuses were conducted in 1990 and 2000, respectively. However, Taiwan does not conduct a by-census in the middle of the intercensal period. Therefore, we only use the 1990 and 2000 Taiwan census data. There are two notable points when we use the Taiwan censuses. First, to ensure the comparability between the treatment and the comparison group, we choose only one city in Taiwan, that is, Taipei. Second, we further restrict our sample to local Taipei residents.

Table 2c reports the summary statistics based on the 1990 and 2000 Taiwan census. Like the HK census, the Taiwan census contains the same three variables measuring mar-

¹⁷There is only one head in each household in censuses 1991 and 2001 and by-census 1996. But there are multiple head in a household in by-census 1996.

ital status and another two variables measuring family structure. However, the Taiwan census does not contain information on the individual's labor market outcomes as in the HK census.

5.3 The Graphic Analysis

Based on the summary statistics in Tables 2a-2b, this subsection presents the descriptive time series of the marital status of HK residents by gender. Figures 4a-4c depict the proportion of persons aged 15-65 who were currently married, ever married, and divorced and not remarried by gender. Two clear patterns are observed from these figures. First, the currently-married, ever-married, and divorced and not-remarried trends in HK have exhibited a gender-diverging pattern in the past two decades. For example, for males, the currently-married rate has experienced substantial increase across the four census years. On the contrary, for females, the currently-married rate has decreased. It is important to note that the currently-married rate for males surpassed that for females in the 2006 census (Figure 4a), although historically the currently-married rate for females has been higher than males across almost all societies (Becker, 1991). Given that both the sex ratio at birth (Figure A1 in the web appendix) and the sex ratio of the residents born in HK (Figure A2) have been stable and balanced in the past decades, these gender-diverging trends in the marriage status across HK residents can be well explained by cross-boundary marriages. Second, these gender-diverging patterns have been more evident since the 1996 census. For example, the currently-married rate for males has sharply increased since the 1996 census (Figure 4a).

6 Empirical Results

This section reports our main empirical results. Table 3 first presents the DD estimates of Equation (13), using Taiwan residents as a comparison group. These estimates capture the regional changes in the outcomes after the discrete increases in OWP quotas and the handover. The top panel shows that HK women's currently-married and ever-married rates decreased by 2.2 and 1.8 percentage points, whereas their separated and divorced rates increased by 0.7 percentage points after the increases in OWP quotas and the handover, compared to Taiwan women. All estimates are statistically significant at a high level of 5% after adjusting for the region and census year clustering (column (2)). The results for men are opposite to those for women (column (3)). The results are consistent with Proposition 1 in our theoretical analysis, suggesting that the decrease in cross-boundary marriage costs enhances the marriage rate for men while reduces it for women. We conclude that the increases in OWP quotas and the handover have decreased women's relative position in the marriage market.

We further find that HK women's intrahousehold bargaining power decreased compared to Taiwan women during the same period. The lower panel of Table 3 reports

that the probability of being a household head decreased by 6.3 percentage points for HK women after the discrete increases in OWP quotas and the handover, suggesting a decrease in their intrahousehold bargaining power. The estimate is statistically significant at a high level of 1%. The results are consistent with Proposition 2. At the same time, the result contradicts the boom hypothesis. We further find that the probability of being single with children increased by 1.6 percentage points. Finally, the results for men are just the opposite to those for women.

Although Taiwan residents serve as a good comparison group for HK residents, it is possible the time trend is different between the two regions which may be due to potential unobservable factors. So, we focus on the gender differential change in the outcomes of HK residents below by estimating Equation (14). The results are reported in Table 4.

The top panel presents the results on marital status. Column (1) shows that the change in gender difference in marital status is consistent with those reported in the top panel of Table 4 when we use Taiwan residents as a comparison group, confirming Proposition 1 again. Relative to men, the currently-married and ever-married rates decreased by 7.7 and 6.0 percentage points, whereas the separate or divorced-rate increased by 1.5 percentage points. The three estimates are statistically significant at 1%. When the whole sample is divided into two subsamples of highly- and lowly-education groups, we find that women with educational attainments lower than the tertiary level are more likely to be affected by the cross-boundary marriages. The magnitudes (in terms of absolute values) of the three estimates for the highly-educated group are only one third to one half of those for the lowly-educated group. Furthermore, the estimates of currently-married and ever-married rates are statistically significant. These results are consistent with Corollary 1.

The middle panel reports the results on family structure. As predicted by Corollary 2, we find that HK women's relative bargaining power within the household decreased with cross-boundary marriages. This result is consistent with that reported in Table 3. When we split the sample to the highly-educated and lowly-educated groups, we find an interesting result. Relative to men, the decrease in household bargaining power is significantly larger for the highly-educated women than that for the lowly-educated ones. The apparent puzzle can be rationalized by our theoretical model. The smaller decrease in intrahousehold bargaining power for lowly-educated women is because they married down and have relative higher SES to their husbands than that in the case when cross-boundary marriage had not increased. As for the highly-educated women, they have same husbands even after the increase in cross-boundary marriages. These results are strongly consistent with Proposition 2 and Corollary 2, whereas contradict the boom hypothesis discussed in the theoretical analysis.

Combining the results reported in both the top and middle panels, we conclude that the HK women with high SES lose their welfare only at the "intensive" margin because of

the loss of the intrahousehold bargaining power.¹⁸ But the HK women with low SES lose their welfare not only at the "extensive" margin but also at the "intensive" margin. The former is due to the decrease in the probability of being married and the increase in the probability of being divorced, and the latter is because of the loss of the intrahousehold bargaining power. The discussion above indicates that the welfare loss at the intensive margin is larger for the women with high SES is larger than that for the women with low SES. However, the relative decrease in the welfare is larger for the latter group, as a whole, because being involuntarily unmarried or divorced causes a large loss for an individual's welfare as specified in our theoretical model.

We then examine the labor market outcomes. The estimates are reported in the low panel of Table 4. We find that HK women are more likely to participate in the labor market, to be employed, to take a second job than men after the discrete increase in OWP quotas and the handover, and their monthly wage income was also higher (column (2)). All the four estimates are statistically significant at 1%. We conclude that the results show an incentive effect on HK women's labor market behavior, as predicted by Corollary 3, rather than that the HK labor market became more favorable toward HK women. First, although the female labor force participation rate increased by 8.1 percentage points, the employment rate increased by only 1.3 percentage points, relative to men.¹⁹ It means that 6.8 percentage points of HK women who had participated in the labor market were unemployed. The labor market actually became worse toward women. Second, the increase in female's income is mainly because they worked harder. The estimates show that, although the wage income increased 0.5%, there is an increase of 0.6 percentage points of HK women who took a second job. If we assume that the wage income of the second job is 80% of the first job, then a 0.6 percentage points increase in taking a second job translates into a 0.48% increase in income. So, the gender difference in wage income had little change after the increase in the cross-boundary marriages.

We split the sample by educational attainment and the results are reported in columns (3)-(4). We find that there is an incentive effect on for both highly- and lowly-educated HK women relative to men, but the effect is larger for the lowly educated group. This is consistent with our theoretic model in which the welfare of all HK women's is negatively affected by the decrease in cross-boundary marriage costs, and women in low tail of the distribution suffer the largest (Proposition 2). The result also justifies the assumption used in our theoretical model. The gain for Mainland brides from cross-boundary marriages is not mainly from the labor market because of their very low labor force participation (Bacon-Shone et al., 2008). If the Mainland brides whose quality is relatively low actively participate in the labor market, the competition in the labor market would

¹⁸ Although the rate of being divorced increased for highly educated women, Table 4 reports insignificant effects of the decrease in cross-boundary marriage costs on the rates of being currently married and ever married.

¹⁹ The employment here is defined on the total population here.

become fiercer for the lowly-educated HK women. Correspondingly, their wage income should decrease. In contrast, we find that the wage income marginally increases for this group. Furthermore, our results with labor market outcomes clearly contradicts the boom hypothesis because it assumes that the labor market favored the highly-educated women.

To sum up, the empirical results with marital status, family structure, intrahousehold bargaining, and labor market outcomes are highly consistent with our theoretical predictions. The discrete increases in the OWP quotas and the handover decreased the cost of cross-boundary marriages, and reduce HK women's relative position both in the marriage market and within the household. The disadvantaged position for HK women exerts an incentive effects on their labor market behaviors.

As always, there were potential confounders in using a difference-in-differences estimator. But we cannot imagine any other socioeconomic and institutional factor in Hong Kong that could fundamentally change the demographic structure and economic behavior differently between men and women in such a consistent pattern as we reported.

We finally note that the effects of the increase in gender-asymmetric cross-boundary marriages are similar to the effects of an increase in the share of females in the total population as in the autarky marriage market (Equations (9)-(10)). This correspondence directly links our results to the literature in examining demographic and economic consequences of sex ratio imbalance such as Angrist (2002). But our results differ from his in some aspects. For example, he finds that the increase in sex ratios enhances the currently-married rates for both males and females. He further finds that the effects for females are consistently larger than those for males on both demographic and economic outcomes. Our results, as reported in Table 3, show opposite effects for men and women. Furthermore, the magnitude of the effects (in terms of absolute values) appears to be very similar for men and women. These differences are mainly originated from the fact that, while he analyzes the change in group-specific sex ratios holding aggregate sex ratios constant, we focus on the economy-wide variations in sex ratios.

7 Repercussion Effects

This section tests the repercussion effect of cross-boundary marriages as stated in Corollary 4. We use the 2001 Canada Census Integrated Public Use Microdata Series (IPUMS) file (2.5% sample) and the 2000 US Census IPUMS file (5% sample), and focus on the immigrants in these countries. Given the fact that about 80% of the HK emigrants are moving to North America, HK immigrants in the two censuses approximately constitute a representative sample of the HK emigrant population. We draw on two subsamples from the two censuses. The first subsample includes all those who have immigrated to the United States or Canada since 1991. To secure the comparability of the treatment and the comparison groups in our estimation of the repercussion effect, we further restrict the first subsample to the one including immigrants who were only from HK, Taiwan, Singa-

pore, and South Korea. This is the second subsample. Given that these four economies are called as “Asia’s Four Little Tigers” in terms of their economic performance, we consider that the immigrants from Taiwan, Singapore, and South Korea constitute a sound comparison group with those from HK.

Based on the two subsamples, we focus on the estimation of the following equation:

$$Gender_i = \gamma_0 + \gamma_1 T_i + \gamma_2 HK_i + \gamma_3 T_i * HK_i + X_i \gamma_4 + US_i + \varepsilon_i. \quad (15)$$

The above equation is similar to Equation (13). We use a dummy variable of *Gender* as the dependent variable. It equals one if the immigrant is a female; otherwise, it equals zero. With regard to the independent variable of *T* measuring the treatment period, we consider 1991-1996 as the pre-treatment period, and 1997 onwards as the post-treatment period. We further consider the immigrants from HK as the treatment group ($HK = 1$) and the immigrants from other places as the comparison group ($HK = 0$). *X* is a vector of variables measuring individual characteristics. Finally, given that we pool two census data sets, we include a dummy variable of *US* indicating the US census. ε is the error term.

Corollary 4 predicts that γ_2 is negative, and the magnitude of γ_2 should be larger (in terms of absolute value) in the sample of lowly-educated group. The results are reported in Table 5. Using all other immigrants in North America as a comparison group, column (1) of Panel A reports the change in gender difference in immigrants from HK. We find that HK women are more likely to migrate to North America after the increase in the OWP quotas and the handover than men do. The estimate of a_3 is both statistically and economically significant. Relative to immigrants from other regions, the number of females from HK increased by 6.8 per 100 immigrants from 1997.

In column (4) of Panel B, we restrict the comparison group to immigrants from Taiwan, Singapore, and South Korea in North America. We find that the results are very similar to those reported in column (1). Finally, we find that the increased female immigrants from HK since 1997 are focused on the lowly-educated group. Therefore, we conclude the results reported in Table 5 show that the cross-boundary marriages induced by the increase in OWP quotas and the handover led more lowly-educated women to migrate to North America than other groups did. These results are strongly consistent with Corollary 4 in our theoretical analysis, and again contradict the boom hypothesis.

8 Discussion and Conclusion

We theoretically and empirically investigate cross-boundary marriages and their demographic and economic consequences. Because of the gender asymmetry in evaluating individual attributes in the marriage market, more women marry from poor regions to men in rich regions than the reversal combination. We thus expect a geographic manifestation of hypergamy. When cross-boundary marriage costs decrease, there are more gender-asymmetric cross-boundary marriages. The relative position of women in rich regions deteriorates in both the marriage market and within the household. The disadvantaged position further exerts an incentive effect on their labor market behavior. Finally, there is a repercussion effect of the increase in cross-boundary marriages that drive more women in the rich regions migrate to richer ones than men do, displaying a chain of geographic manifestation of hypergamy. These theoretical predictions are confirmed by our empirical analysis on the cross-boundary marriage between Mainland China and HK.

Guided by the theoretical model, our empirical analysis establishes the interaction between the hypergamic preference and the cost deduction as the driving force for the drastic increase in gender-asymmetric cross-boundary marriages in HK. The empirical results contradict the alternative hypothesis based the boom of higher female education. The same story may also account for the increase in cross-boundary marriages in other regions such as Taiwan, South Korea, and Singapore. It is possible that, along with the revolution in communication technologies during the past decades, the cross-boundary marriage costs have decreased in these regions. This increases the demand for cross-boundary marriages, stimulating the service market for cross-boundary marriages. The flourishing of cross-boundary marriage brokers and the internet dating systems further reduces the cost. These effects reinforce each other, driving up a drastic increase in gender-asymmetric cross-boundary marriages. The fiercer competition in the low tail of the distribution for females in these East Asian regions could lead to the boom in higher female education. Under this hypothesized logic, the boom in higher female education is a consequence rather the cause of the increase in cross-boundary marriages. We analyze this hypothesis in another study. The decrease in cross-boundary marriage costs, however, is usually entangled with the change in other socioeconomic factors, posing an identification problem in empirical testing. The value of the HK experience is that cross-boundary marriages are strictly regulated by the exit policy on the Mainland side. The increases in the OWP quotas plus the handover sever as quasi-experiments exogenously reducing the cost, compared to neighboring regions such as Taiwan.

Finally, the present study raises a normative issue. As demonstrated by our theoretical model and verified by the empirical results, the total welfare increases from the case of autarky marriage market to the one with cross-boundary marriages, because the optimal assignment profile in the autarky marriage is still a possible choice in the second case.

But the welfare of women in rich regions loses. So relaxing marriage immigration policies is not a Pareto improvement. Governments do face the equality vs. efficiency trade-off when they implement and revise these policies.

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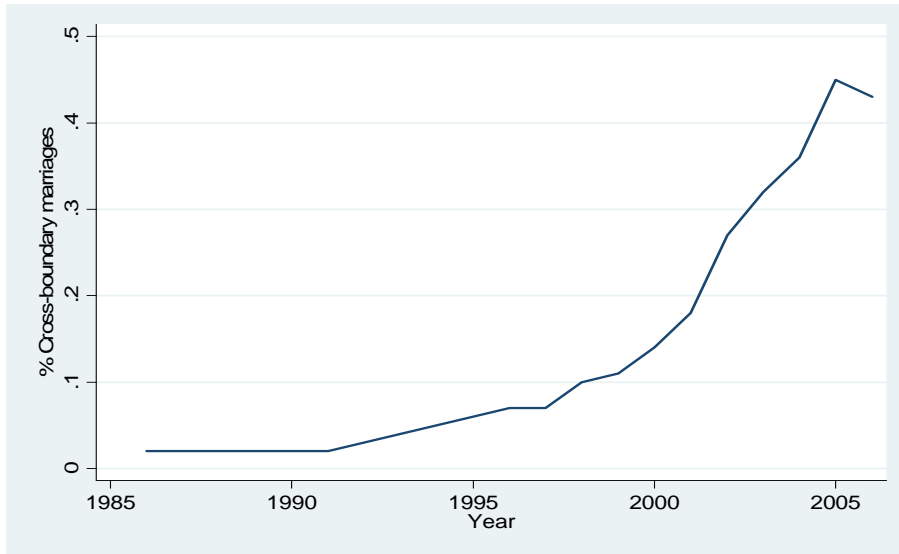


Figure 1. The Fraction of Cross-boundary Marriages in all Marriages registered in Hong Kong, 1986-2006

Data source: Census and Statistics Department (CSD), 2007, *Marriage and Divorce Trends in Hong Kong, 1981 to 2006*, Hong Kong: Census and Statistics Department Printing.

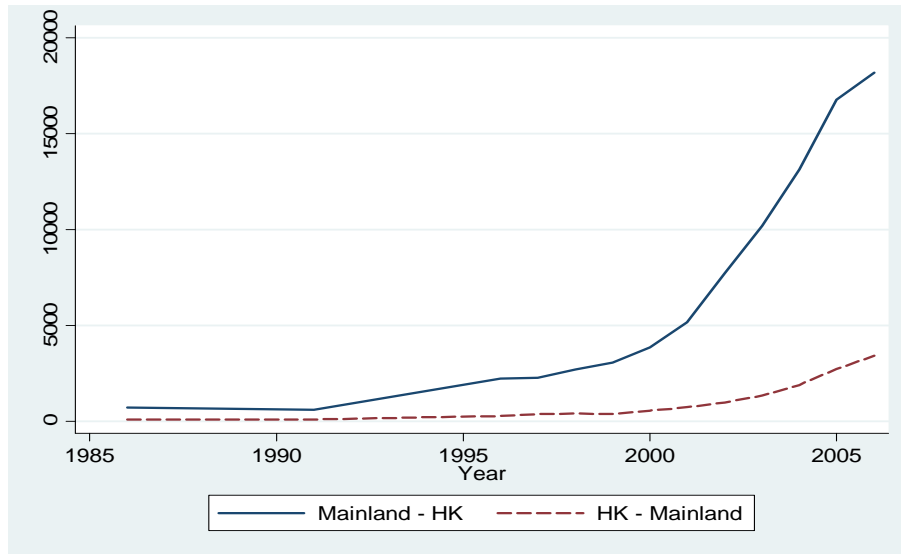


Figure 2. Number of Cross-boundary Marriages Registered in Hong Kong by Residence of Spouses, 1986-2006

Data source: Census and Statistics Department (CSD), 2007, *Marriage and Divorce Trends in Hong Kong, 1981 to 2006*, Hong Kong: Census and Statistics Department Press.

Note: Mainland - HK: Mainland bride and Hong Kong groom; HK - Mainland: Hong Kong bride and Mainland groom.

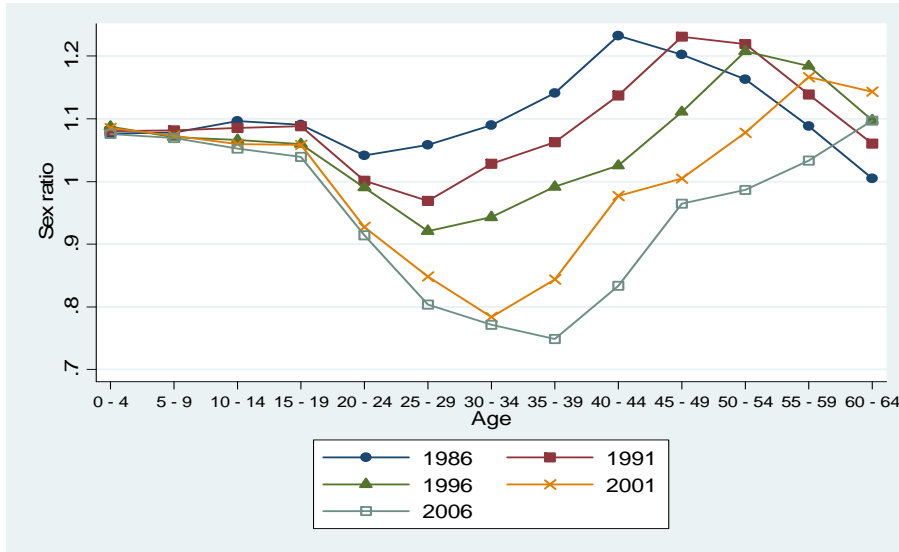


Figure 3. Sex ratios (males/females) by age group and by year in Hong Kong (whole population), 1986-2006

Data Sources: The 1991, 2001 Hong Kong censuses (5% sample) and the 1986, 1996, and 2006 Hong Kong by-censuses (50% sample)

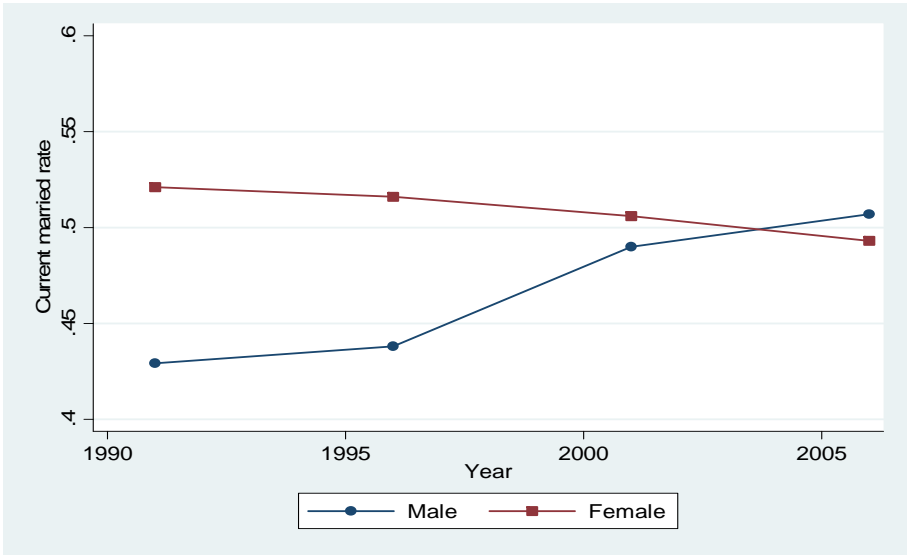


Figure 4a. The proportion of persons aged 15-65 who were born in Hong Kong and were currently married by year and by gender, 1991-2006

Data Sources: The 1991, 2001 Hong Kong censuses (5% sample) and the 1996, and 2006 Hong Kong by-censuses (50% sample)

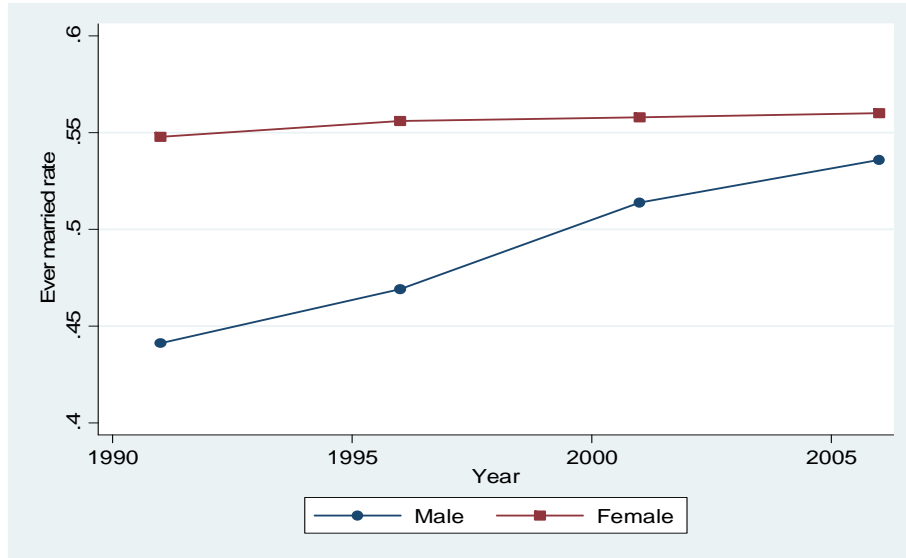


Figure 4b. The proportion of persons aged 15-65 who were born in Hong Kong and were ever married by year and by gender, 1991-2006

Data Sources: The 1991, 2001 Hong Kong censuses (5% sample) and the 1996, and 2006 Hong Kong by-censuses (50% sample)

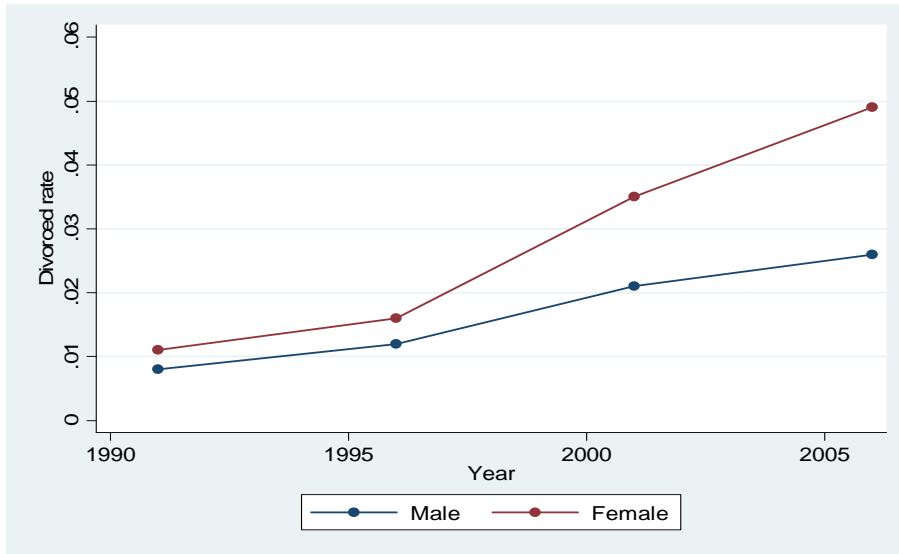


Figure 4c. The proportion of persons aged 15-65 who were born in Hong Kong and were currently divorced by year and by gender, 1991-2006

Data Sources: The 1991, 2001 Hong Kong censuses (5% sample) and the 1996, and 2006 Hong Kong by-censuses (50% sample)

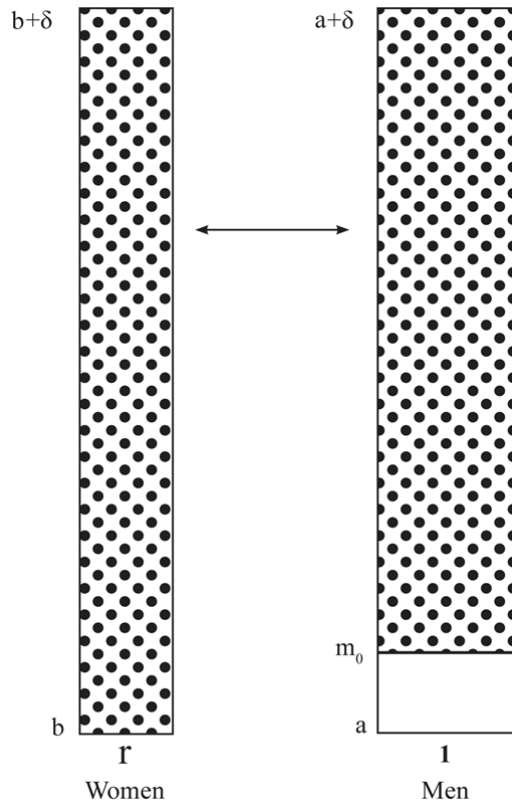


Figure 5. The assignment profiles in the autarky marriage market

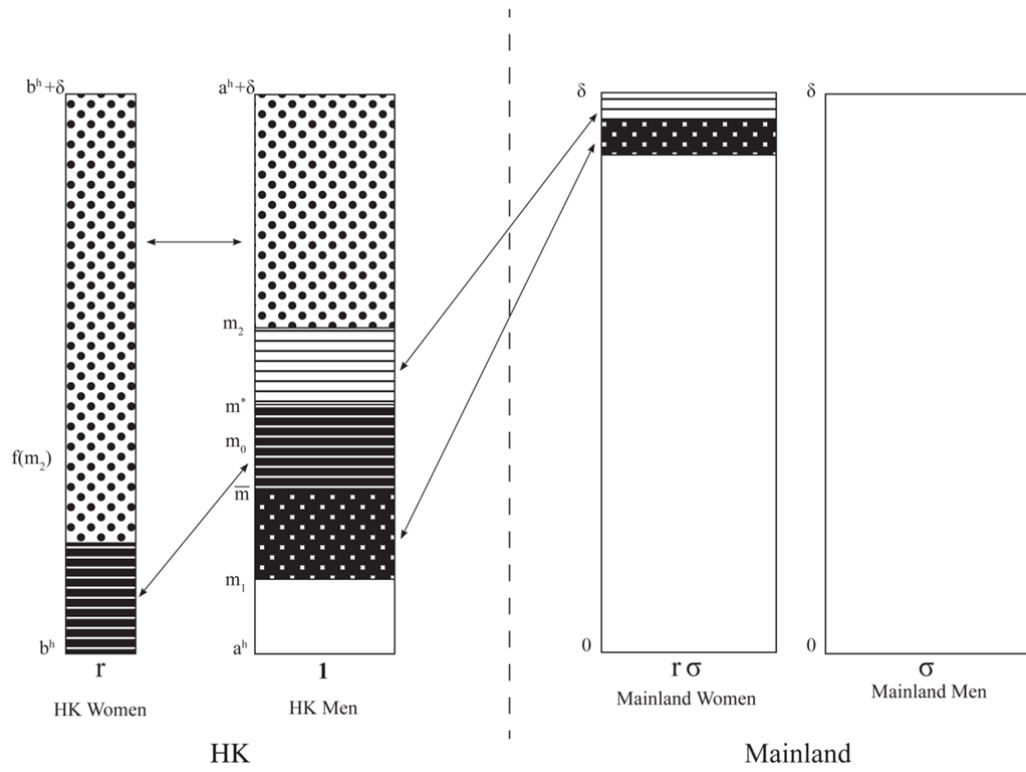


Figure 6. The assignment profiles in the interior solution with cross-boundary marriages

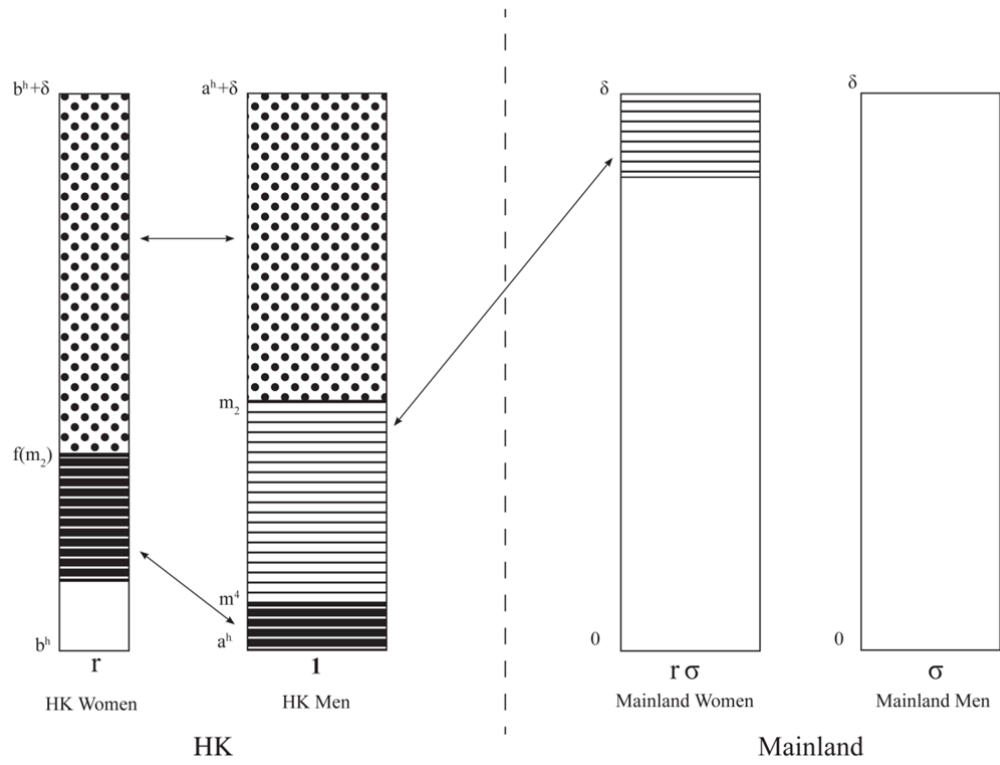


Figure 7. The assignment profiles in the corner solution with cross-boundary marriages

Table 1a. Median age at marriage by residence of spouses, 2006

	Marriage types by residence of spouses				
	HK bride	Mainland bride	HK bride	Mainland bride	Total
	HK groom	HK groom	Mainland groom	Mainland groom	
	(1)	(2)	(3)	(4)	(5)
Groom	32.0	38.7	26.9	28.4	33.1
Bride	29.5	28.8	27.2	26.0	29.4

Data source: Bacon-Shone, John, Joanna K.C. Lam, and Paul S.F. Yip, 2008, *The Past and Future of the One Way Permit Scheme in the Context of a Population Policy for Hong Kong*, Bauhinia Foundation Research Centre.

Note: The statistics only include all marriages registered in Hong Kong in 2006.

Table 1b. Distribution of education attainments by residence of spouses, 2006

Education attainment	Sex	Residence of spouses				Total
		HK bride HK groom	Mainland bride HK groom	HK bride Mainland groom	Mainland bride Mainland groom	
Primary or below	Groom	5.6%	25.8%	36.0%	32.7%	15.8%
	Bride	6.9%	38.6%	28.0%	34.1%	20.8%
Secondary	Groom	76.0%	71.9%	61.7%	63.5%	73.3%
	Bride	78.8%	60.6%	70.6%	62.6%	71.1%
Tertiary (non-degree)	Groom	11.8%	1.5%	1.4%	2.0%	7.0%
	Bride	9.3%	0.5%	0.9%	1.9%	5.3%
Tertiary (degree)	Groom	6.6%	0.8%	0.9%	1.7%	3.9%
	Bride	5.0%	0.3%	0.6%	1.4%	2.8%

Data source: Bacon-Shone, John, Joanna K.C. Lam, and Paul S.F. Yip, 2008, *The Past and Future of the One Way Permit Scheme in the Context of a Population Policy for Hong Kong*, Bauhinia Foundation Research Centre.

Note: The statistics only include all marriages registered in Hong Kong in 2006.

Table 2a. Descriptive statistics of women (Hong Kong Censuses)

	Censuses			
	1991	1996	2001	2006
<u>Marital status</u>				
Currently married	0.565 [0.496]	0.574 [0.495]	0.537 [0.499]	0.510 [0.500]
Ever married	0.586 [0.493]	0.608 [0.488]	0.586 [0.492]	0.572 [0.495]
Currently divorced	0.013 [0.111]	0.024 [0.152]	0.038 [0.191]	0.051 [0.220]
<u>Family structure</u>				
Household head	0.133 [0.340]	0.159 [0.365]	0.193 [0.395]	
Single with children	0.012 [0.107]	0.021 [0.144]	0.037 [0.190]	0.045 [0.207]
<u>Labor market</u>				
Labor force participation	0.652 [0.476]	0.664 [0.473]	0.702 [0.457]	0.722 [0.448]
Employed	0.967 [0.178]	0.973 [0.163]	0.970 [0.172]	0.959 [0.199]
Wage income (HK \$1,000)	7.300 [6.635]	14.027 [13.409]	16.884 [15.111]	16.658 [15.278]
Hold a second job	0.020 [0.140]	0.016 [0.126]	0.021 [0.145]	0.019 [0.138]
<u>Other variables</u>				
Age	30.798 [8.317]	32.978 [8.795]	34.863 [9.868]	36.542 [10.502]
Schooling years	9.507 [3.751]	10.504 [3.938]	10.817 [3.816]	11.591 [3.928]
N	45903	55876	63515	67972

Data sources: Hong Kong censuses 1991, 2001, and by-censuses 1996, 2006

Note: Standard errors are in brackets.

Table 2b. Descriptive statistics of men (Hong Kong Censuses)

	Censuses			
	1991	1996	2001	2006
<u>Marital status</u>				
Never married	0.531 [0.499]	0.471 [0.499]	0.460 [0.498]	0.455 [0.498]
Currently married	0.459 [0.498]	0.511 [0.500]	0.516 [0.500]	0.517 [0.500]
Currently divorced	0.009 [0.093]	0.016 [0.125]	0.022 [0.146]	0.026 [0.159]
<u>Family structure</u>				
Household head	0.429 [0.495]	0.451 [0.498]	0.493 [0.500]	0.763 [0.425]
Single with children	0.005 [0.073]	0.008 [0.089]	0.009 [0.096]	0.009 [0.095]
<u>Labor market</u>				
Labor force participation	0.966 [0.182]	0.967 [0.178]	0.938 [0.241]	0.928 [0.258]
Employed	0.975 [0.156]	0.966 [0.180]	0.952 [0.214]	0.947 [0.224]
Wage income (HK \$1,000)	10.100 [10.290]	17.664 [18.133]	20.958 [20.361]	19.553 [19.521]
Hold a second job	0.033 [0.177]	0.024 [0.154]	0.028 [0.164]	0.021 [0.143]
<u>Other variables</u>				
Age	30.929 [8.441]	33.117 [8.930]	34.868 [9.877]	36.530 [10.518]
Schooling years	10.120 [3.631]	10.988 [3.886]	11.119 [3.779]	11.736 [3.902]
N	47488	58489	65594	69729

Data sources: Hong Kong censuses 1991, 2001, and by-censuses 1996, 2006

Note: Standard errors are in brackets.

Table 2c. Descriptive statistics (Taiwan Censuses)

	Census 1990		Census 2000	
	Women	Men	Women	Men
<u>Marital status</u>				
Never married	0.271 [0.445]	0.342 [0.474]	0.316 [0.465]	0.373 [0.484]
Currently married	0.687 [0.464]	0.635 [0.481]	0.628 [0.483]	0.593 [0.491]
Currently divorced	0.022 [0.147]	0.019 [0.136]	0.037 [0.189]	0.031 [0.173]
<u>Family structure</u>				
Household head	0.136 [0.343]	0.636 [0.481]	0.244 [0.430]	0.599 [0.490]
Single with children	0.019 [0.135]	0.015 [0.121]	0.027 [0.161]	0.019 [0.136]
<u>Other variables</u>				
Age	33.379 [9.719]	33.928 [9.621]	35.329 [10.237]	35.622 [10.163]
Schooling years	9.384 [4.035]	10.281 [3.618]	11.293 [3.405]	11.700 [3.141]
N	718,187	697,651	1,021,086	984,698

Data sources: Taiwan censuses 1990, 2000

Note: Standard errors are in brackets.

Table 3. Cross-boundary marriages and family behaviors of Hong Kong residents, using Taiwan residents as a comparison group

	Mean (1)	Women (2)	Men (3)
Marital status			
Currently married	0.625	-0.022** [0.003]	0.029*** [0.000]
Ever married	0.336	-0.018** [0.003]	0.027*** [0.000]
Currently divorced	0.028	0.007** [0.001]	-0.002* [0.001]
Family structure			
Household head	0.398	-0.063*** [0.004]	0.041*** [0.001]
Single with children	0.186	0.016*** [0.000]	-0.002** [0.000]

Data sources: Hong Kong censuses 1991 and 2001; Taiwan censuses 1990 and 2000.

Note: Each entry in columns (2)-(3) comes from a separate regression of Equation (30) with the dependent variable listed in the left column. We report the difference-in-difference estimates. Age, age square, educational years are included in all specifications. Robust standard errors adjusted for Hong Kong census*census year clustering are reported in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4. Cross-boundary marriages and the gender differences in family behavior of Hong Kong residents

	Mean (1)	Total population (2)	Highly educated (3)	Lowly educated (4)
Marital status				
Currently married	0.523	-0.077*** [0.022]	-0.029 [0.030]	-0.076*** [0.020]
Ever married	0.444	-0.060*** [0.022]	-0.022 [0.030]	-0.056*** [0.020]
Currently divorced	0.026	0.015*** [0.002]	0.007*** [0.002]	0.017*** [0.002]
Family structure				
Household head	0.437	-0.101*** [0.022]	-0.147*** [0.029]	-0.088*** [0.022]
Single with children	0.020	0.022*** [0.002]	0.004 [0.003]	0.027*** [0.002]
Labor market				
Labor force participation	0.821	0.081*** [0.017]	0.017 [0.011]	0.065*** [0.017]
Employed	0.962	0.013*** [0.002]	0.006** [0.002]	0.016*** [0.002]
ln(wage income)	9.393	0.005*** [0.017]	-0.007 [0.016]	0.004** [0.016]
Hold a second job	0.023	0.006*** [0.001]	0.004* [0.002]	0.007*** [0.001]

Data sources: Hong Kong censuses 1991 and 2001, and by-censuses 1996 and 2006.

Note: Each entry in columns (2)-(3) coming from a separate regression of Equation (31) with the dependent variable listed in the left column. We report the difference-in-difference estimates. Age, age square, educational years, and a time trend are included in all specifications. Robust standard errors adjusted for census year*female clustering are reported in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5. Cross-boundary marriages and the emigration of Hong Kong residents to Canada and US

	Dependent variable: Gender (Female=1)		
	Panel A. All immigrants in North America		
	Total (1)	Highly educated (2)	Lowly educated (3)
T (Year 1997-2000=1)	-0.025*** [0.003]	-0.031*** [0.006]	-0.025*** [0.004]
Hong Kong immigrant	0.013 [0.017]	0.001 [0.027]	-0.002 [0.021]
T* Hong Kong immigrant	0.068** [0.030]	0.004 [0.056]	0.099*** [0.036]
N	106911	31318	75593
	Panel B. Immigrants from Hong Kong, Taiwan, Singapore, and South Korea in North America		
	Total (4)	Highly educated (5)	Lowly educated (6)
T (Year 1997-2001=1)	-0.037* [0.020]	-0.044 [0.028]	-0.042 [0.027]
Hong Kong immigrant	-0.051* [0.028]	-0.046 [0.044]	-0.096** [0.036]
T* Hong Kong immigrant	0.073** [0.036]	0.017 [0.063]	0.110** [0.046]
N	4055	1885	2170

Data source: Canada population census 2001 and US population census 2000.

Note: Robust standard errors adjusted for census year*age clustering are reported in brackets.
 * Significant at 10%; ** significant at 5%; *** significant at 1%. Age, age square, and a dummy of US census is included in all specifications.