CROSS-BORDER MARRIAGE COSTS AND MARRIAGE BEHAVIOR: THEORY AND EVIDENCE*

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This article analyzes cross-border marriages between mainland China and Hong Kong (HK). We examine the effects of a reduction in cross-border marriage costs following an increase in marriage-migration quotas and the handover of HK to China. We find that cross-border marriages mainly involve men from the low tail of the HK attribute distribution. We also find that HK women's position in the marriage market and within households deteriorated following the reduction in cross-border marriage costs and that their disadvantaged position exerts an incentive effect on their labor market behavior. These outcomes are consistent with our matching model.

1. INTRODUCTION

Marriages that cross the borders of nations or states have become increasingly common, although they have received relatively little academic attention.[2] In some cases, marriages are increasingly becoming the cause instead of the consequence of international migration. For example, marriage migration to the United States almost tripled between 1960 and 1997, increasing from 9% to 25% of all immigration (Constable, 2005). In 2009, the number of international migrants under the family-reunion scheme accounted for 35% of the total number of international migrants around the world (International Migration Organization, 2010).

The economics literature on international migration has so far focused on labor migration (Borjas, 1999), whereas little research has investigated marriage migration.[3] The main motive of marriage migrants is different from that of labor migrants. Their labor force participation rates are generally lower than that of natives. Thus, examining the long-run consequences of the increase in cross-border marriages on both local marriage and labor markets is interesting.[4]

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[2] Cross-border marriages are prevalent in many developed Asian economies. The rates of marrying a foreigner among newlyweds for men in 2010 were 35% in Singapore, 22% in Taiwan, and 8.3% in South Korea (Kawaguchi and Lee, 2012). In 2010, the share of cross-border marriages in all marriages registered in Hong Kong (HK) was above 40% (Figure 1). Cross-border marriages are also common in many European countries. The proportions of cross-border marriages in 2010 were, for example, about 76% in Cyprus, 48% in Switzerland, 22% in Spain, 16% in France, and 14% in Germany (Economist, 2011; Lanzieri, 2012). In 2010, 5% of marriages in Japan and the United States included a foreign spouse. Before 1980, the share was less than 1% in both countries (Constable, 2012).

[3] Kawaguchi and Lee (2012) discuss cross-border marriages in East Asia. We discuss their paper in sections below.

[4] See Bacon-Shone et al. (2008) and Constable (2012).

Cross-border marriages exhibit a clear gender-asymmetric pattern, because the international marriage migrants are primarily women, and most of these women move from the poor "south" to the rich "north," from parts of Asia, Latin America, East Europe, and the former Soviet Union to Western Europe, North America, Australia, and wealthier regions of East Asia. For example, 85% of legal migrants to the United States who married local residents were women in 1997. The Philippines is a popular place of origin of marriage migrants. Of all Filipinos married foreigners in the 1990s, 91% were women. In the late 1990s, more than 99% of over 50,000 new Filipino–Japanese marriages were between Filipino women and Japanese men. This general tendency of poor women to marry rich men abroad has been termed "global hypergamy."[5]

This article attempts to answer two questions: (1) What are the causes of gender-asymmetric cross-border marriages? (2) What are the consequences of gender-asymmetric cross-border marriages on destination countries? We conduct both a theoretical and empirical analysis. We first model cross-border marriages between two regions. One is poor and the other is rich.[6] By examining cross-border marriages between HK and mainland China, we then empirically test the effects of the decrease in cross-border marriage costs on the destination marriage market.

In the theoretical analysis, we first define a male or female's marital attribute as an index to measure the attractiveness in the marriage market. It is a function of some basic traits such as age and income. We then characterize the assignment profiles and utility-shares profiles that would exist under autarky, allowing different marital attributes between the poor and rich regions. We assume that in both regions, the marital attribute function is gender asymmetric. Age is a more important trait in the marriage market for women than for men as a proxy for beauty or fecundity, whereas income or wealth is a more important trait for men than for women, because men usually carry the family's financial responsibility in a traditional society.[7] Under the assumption of gender asymmetry and the difference in region-specific traits such as income, women in the poor country are more attractive to men in the rich country than men in the poor country are attractive to women in the rich country. This situation can result in more men from rich countries marrying women from poor countries than the opposite match, displaying a geographic manifestation of hypergamy or spatial hypergamy.[8]

We further introduce cross-border marriage costs in the form of waiting for the marriage to materialize. With a decrease in cross-border marriage costs, more gender-asymmetric cross-border marriages take place, which erodes the relative position of women in the rich country not only in the marriage market, but also within the household. As the well-being of these women deteriorates, they may be more likely to participate in the labor market and work more.

We empirically test these theoretical predictions by investigating cross-border marriages between mainland China and HK, which serves as a great setting for studying the importance of the immigration cost in explaining cross-border marriages and their consequences in the destination marriage market. First of all, clearly identifiable events triggered the increase in cross-border marriages between residents of HK and mainland China: the handover of HK to mainland China in 1997 and the discrete increases in the one-way permit (OWP) quota. The handover greatly facilitated the interchange between the mainland and HK residents. Furthermore, the cross-border marriage behavior is strictly governed by the OWP scheme, which requires all mainland spouses or children of HK permanent residents to obtain an OWP

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[5] See Constable (2005) for detailed statistical descriptions.

[6] The cross-border marriages also involve both migration from one source country to multiple destination countries and migration from multiple source countries to one destination country. Our article focuses on cross-border marriages from one source country to one destination country.

[7] Our assumption of gender asymmetry in evaluating individual traits is consistent with the experimental evidence on gender differences in mating selection. For instance, in a speed-dating experiment, Fisman et al. (2006) find men respond more to women's physical attractiveness, whereas women prefer men who grew up in affluent neighborhoods. See also Boulier and Rosenzweig (1984).

[8] The term hypergamy is used specifically in reference to a tendency in which females pursue males of 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 article is the tendency of women in poor countries to marry men in rich countries. We thus call it spatial hypergamy.

document before moving to HK for family reunion. The daily OWP quota was 75 in 1982, which then increased to 105 in 1993 and to 150 in 1995. Prior to 1996, the mainland partners or children normally had to wait 8–10 years to obtain an OWP. The waiting period was reduced to 3 to 5 years after 1995. Therefore, the handover and the discrete increases in the OWP quotas serve as good quasi-experiments that exogenously reduced cross-border marriage costs. Third, the observed cross-border marriages are notable for inducing gender asymmetry: HK men marrying mainland women outnumbered the opposite match seven times during the period 1986–2006. Finally, the cross-border marriages between HK and mainland China provide a unique setting to focus on marriage migration. Specifically, the quasi-experiment employed in this article mainly affected marriage migration, not labor migration. Labor migration from mainland China to HK is extremely restrictive and was almost zero during our study period. By contrast, marriage migration is usually intertwined with labor migration.[9] The cross-border marriages between HK and mainland China provide a unique setting to focus on marriage migration.

Using the quasi-natural experiments brought about by the handover of HK to China and the discrete increases in the OWP quotas, the present study first constructs a difference-in-differences (DD) estimator to test the theoretical predictions. Specifically, we use the 1991 and 2001 HK population censuses and the 1996 and 2006 by-censuses. We classify the 1991 and 1996 (by-) census years as the pretreatment period and the 2001 and 2006 (by-) census years as the posttreatment period. With two waves of (by-) censuses, we control for the time trend in our DD estimator. We then examine the changes in gender differences in marital status and the relative power of women within the household between pre- and posttreatment period. Our empirical results show the increases in the OWP quotas and the handover diminished HK females' relative positions both in the marriage market and within the household. Specifically, relative to men, HK women's currently married and ever-married rates decreased by 8.8 and 6.8 percentage points, respectively, whereas their currently divorced rate increased by 1.8 percentage points following the increases in the OWP quota and the handover. Their probability of being a household head decreased by 8.5 percentage points. Finally, we find an incentive effect in the labor market. Compared to men, HK women were more likely to participate in the labor market and take a second job after the discrete increase in the OWP quota and the handover.

We then construct a triple-difference estimator as a robustness check. Specifically, we use Taipei as a comparison group. In order to establish Taipei as a good control group, we carefully check the common trend hypothesis. We find Taipei and HK share a common trend in the gender difference in marital outcomes during the pretreatment period. The triple-difference estimation results are highly consistent with our estimation results without using Taipei as a comparison group.

A major objective of this article is to examine the heterogenous responses of HK residents to the decrease in cross-border marriage costs. That is, which segments of the population are affected by the decrease in cross-border marriage costs, and in what way? For this purpose, we use a simple matching model that predicts which group of HK residents will be mainly affected by cross-border marriages. The model predicts cross-border marriages are more likely to be formed by HK men in the low and middle segments of the male-attribute distributions, because HK men at the top of the HK male distribution already have local "good wives" and would not marry mainland Chinese women given the costs involved. Therefore, the model predicts the change in marital status induced by the increase in the OWP quota and the handover should be focused on the group at the low end and middle of the HK attribute distribution, whereas men and women at the top of the HK distribution will maintain their marriages.

The theoretical prediction thus motivates us to carry out our estimation by educational levels. We find that, in fact, most cross-border marriages involve partners with secondary education.

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[9] For example, some of the Filipino women who were involved in cross-border marriages with Japanese men are domestic workers employed by Japanese households (Constable, 2005).

Furthermore, our estimates show the change in the marital status are indeed focused on the lowly educated group (below college). This result is consistent with our theoretical prediction. But it differs sharply from an alternative hypothesis, whereby the boom in female higher education has driven the rise in cross-border marriages because lowly educated men prefer marrying Chinese women to marrying highly educated HK women.

Our analysis may also explain the causes and consequences of global hypergamy. Along with the revolution in communication technologies in the past decades, cross-border marriage costs decreased, which in turn increased the demand for cross-border marriages and further stimulated the service market for such marriages. The flourishing of international marriage brokers and Internet dating systems further reduced costs. As these effects reinforce each other, a drastic increase in gender-asymmetric cross-border marriages took place. Therefore, we can argue that the main cause for global hypergamy is a combination of the decrease in costs of cross-border marriages and gender asymmetry in marital attributes.

With global hypergamy, a new pattern of regional and gender inequality in the marriage market might emerge, whereby all men gain, but all women lose in rich destination countries. Conversely, all men lose and all women gain in poor source countries. Furthermore, men in the low tail of the marital-attribute distribution in rich countries and women in the upper tail of the distribution in poor countries gain the most, whereas women in the low tail of the marital-attribute distribution in rich countries and men in the low tail of the distribution in poor countries lose the most.[10]

The remainder of this article is organized as follows. Section 2 discusses the related literature and Section 3 describes the background. Section 4 formulates the theoretical model. Section 5 introduces the data sets and specifies our empirical strategy. Section 6 presents our empirical results and Section 7 concludes.

2.   RELATED LITERATURE

We study cross-border marriages, which is a relatively new topic in the economics literature. We contribute to the research agenda in family economics that explains marriage patterns and the impact of the sex ratio on marriage outcomes and marital shares. Little economic research has explicitly studied hypergamy. Siow (1998) discusses the effect of gender difference in fecundity on the average age gap between husbands and wives. Saint-Paul (2009) constructs a model in which women know who their children are but men do not. In such a model, a marriage is more likely to occur when the husband has more human capital than the wife. We contribute to this strand of the literature by showing that different gender-asymmetric distributions of male and female marital attributes in two interrelated marriage markets can explain the gender-asymmetric cross-border marriage patterns that display a geographic manifestation of hypergamy or spatial hypergamy.

Recently, a wave of new studies has examined the consequences of changes in marriage-market conditions such as the sex ratio (e.g., Chiappori et al., 2002; Ebenstein, 2010, 2011; Bhaskar, 2011; Edlund et al., 2013a, 2013b; Lafortune, 2013). Our article contributes to this literature by showing that, following the exogenous reduction in cross-border marriage costs, the sex ratio and the composition of available types in the HK marriage market are endogenous outcomes, reflecting optimal choices of agents in HK and mainland China to form cross-border marriages based on the different attributes and associated marital shares in the two regions.

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[10] These distributional welfare implications are derived from several simplifying assumptions, including that women involved cross-border marriages from poor regions have perfect foresights and full information. We ignore that living in a new country with unfamiliar people, language, and culture might be difficult for them. The Economist (2011) reports that although some young women involved in cross-border marriages are victims of cruelty, neglect, physical abuse, and trafficking, this pattern is not the dominant one, yet alone the sole one. Cross-border marriages often seem to work for the couple involved, and the age and education gaps do not seem to affect marriage stability.
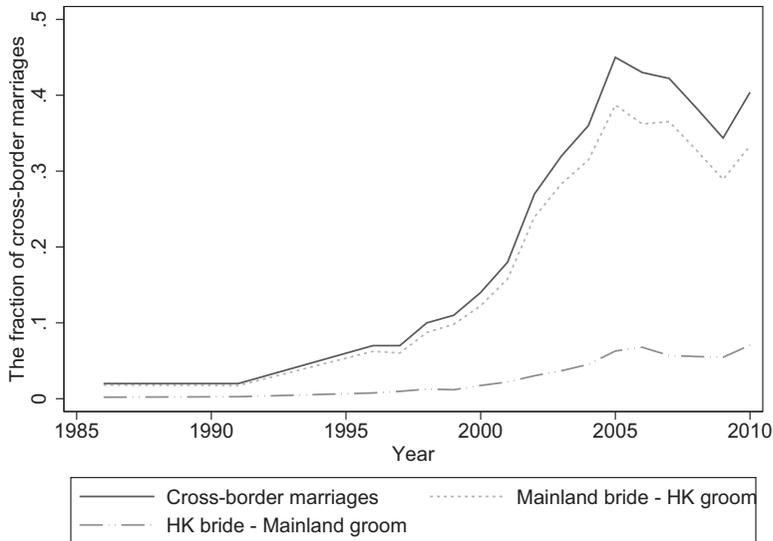
Data source: Census and Statistics Department, 2011.

FIGURE 1

THE FRACTION OF CROSS-BORDER MARRIAGES IN ALL MARRIAGES REGISTERED IN HONG KONG, 1986–2010

3. BACKGROUND

3.1. *The OWP, Cross-Border Marriages, and Gender Imbalance in HK.* Cross-border marriages have become an increasingly important element in marriages involving HK residents. Figure 1 shows the fraction of cross-border marriages of all marriages registered in HK from 1986 to 2010. The ratio shot up from 2% in 1986 to 43% in 2006 and has remained at that level. A clearly identifiable event triggered the sharp increase in cross-border marriages between residents of the mainland and HK: the handover of HK to mainland China in 1997. Furthermore, the exit policies of the mainland government of which the OWP scheme is most important strictly govern the cross-border marriage behavior in HK. Compared with the lenient immigration policies on family reunion worldwide, extremely restrictive migration policies govern the residency of the mainland Chinese in HK, even for the spouses and children of HK permanent residents.

The mainland authority implements the OWP scheme to allow families with spouses and children residing in the mainland to be reunited in HK while preventing a large volume of immigration to HK. The OWP is available to two groups of immigrants: children of permanent HK residents with a Certificate of Entitlement, and spouses and other dependents. The OWP scheme stipulates that all mainland spouses or children of HK permanent residents must obtain an OWP document to migrate to HK to reunite with their families. The quota of daily OWP was 75 in 1982, rose to 105 in 1993, and then to 150 in 1995. Prior to 1993, the total number of new arrivals under the OWP scheme was less than 30,000 per year. In 1996, the number hits a record high of 61,179. Prior to 1993, a mainland partner or a child born in mainland China normally waited for 8–10 years to obtain an OWP; however, the length of waiting period has decreased to 3 to 5 years since 1995. The shorter waiting period has greatly reduced both the material and psychological costs, which in turn increased the number of cross-border marriages.

The number of cross-border marriages was significant enough to change the fundamentals of the HK marriage market. Because of HK's superiority in public welfare, education, and medical systems, most mainland partners and children of HK residents migrated to HK under the OWP scheme (Bacon-Shone et al., 2008). The new arrivals under the OWP scheme have been a major driver of population growth in HK during the past two decades. These new arrivals constitute a lion's share of the population growth in HK. During the 1990–2008 period, new arrivals
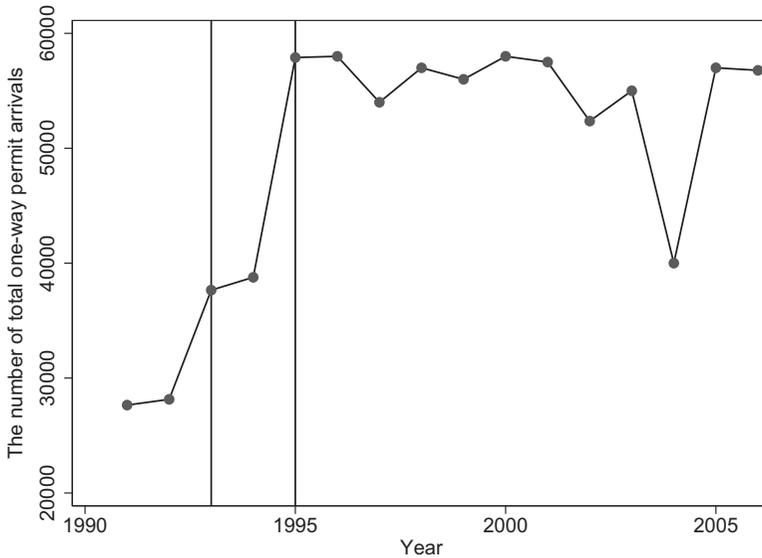
Data source: Bacon-Shone et al. (2008).

FIGURE 2

THE NUMBER OF NEW ARRIVALS UNDER THE ONE-WAY PERMIT SCHEME, 1991–2006

numbered 855,116 under the OWP scheme, accounting for 12.23% of the total population in 2008 and 69.85% of the population growth during the same period. Figure 2 shows two discrete jumps in the number of these arrivals coinciding with the two years when the OWP quota was increased from 75 to 105 in 1993 and further to 150 in 1995.[11]

The observed cross-border marriages are notable for their gender asymmetry. Figure 1 shows HK men marrying mainland women outnumbered the opposite match seven times during the period 1986–2006.[12] Therefore, females have dominated the new arrivals under the OWP scheme, leading to increasingly female-biased sex ratios in HK.[13] Given the large scale of cross-border marriages and these new arrivals, the sex ratio of the HK population has become severely biased toward females.[14] We conclude that the imbalance in the sex ratio in HK is attributable to the gender-asymmetric cross-border marriages between residents of mainland China and HK. This sex-ratio imbalance has drawn serious attention from the mass media, academic researchers, and the HK government (HK Task Force on Population Policy, 2003; Bacon-Shone et al., 2008).[15]

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[11] Figure 2 shows a drop in the number of OWP arrivals in 2004. The mainland authority began to allocate the OWP quotas by provinces in that year, which resulted in a mismatch between applications and quotas across different provinces. Some remote provinces experienced oversupply of OWP quotas (Bacon-Shone et al., 2008). The mainland authority has adjusted the system since 2004.

[12] In the online appendix, Figure A1 shows the number of cross-border marriages registered in HK by residence of spouses from 1986 to 2010, and Figure A2 shows the proportion of marriages registered in HK by residence of spouses from 1991 to 2006. The combination of mainland brides and HK grooms has dominated the opposite match during the past two decades, although the combination of HK brides and mainland grooms has increased since 2000.

[13] Figure A3 in the online appendix depicts the number of new arrivals under the OWP scheme by the type of relatives in HK. It shows approximately half of the arrivals have spouses and the other half have parents in HK. Furthermore, Figure A4 shows that the sex ratio of those new arrivals with spouses in HK was severely biased toward females, although the sex ratio of new arrivals with parents in HK was almost balanced during the 1996–2006 period.

[14] Figure A5 in the online appendix shows the sex ratio decreased more dramatically in censuses 2001 and 2006, in particular, for the age groups of 30–34 and 35–39. The average age of new arrivals with spouses in HK under the OWP scheme is 33.8.

[15] Figure A6 in the online appendix shows the sex ratio at birth has been stable and balanced in past decades. Furthermore, Figure A7 shows that the sex ratio of residents born in HK has also been stable and balanced, suggesting the sex-ratio imbalance is not due to the biased emigration of local HK residents.

TABLE 1
SHARE OF HK GROOMS AND BRIDES (PERCENT) BY OCCUPATION

	HK Grooms		HK Brides	
	HK–HK (1)	HK–Mainland (2)	HK–HK (3)	Mainland–HK (4)
Managers and administrators	16.38	11.30	10.77	6.53
Professionals	18.82	3.67	14.03	2.91
Associate professionals	16.48	8.71	10.95	2.44
Clerks	9.48	5.76	30.97	11.57
Service workers and shop sales workers	13.32	13.03	13.14	7.87
Skilled agricultural and fishery workers	0.21	0.57	0.09	0.62
Craft and related workers	5.51	14.54	0.72	3.78
Plant and machine operators and assemblers	6.48	9.83	0.27	0.20
Elementary occupations	7.32	16.66	2.51	1.13
No/other/unknown occupations	6.00	15.94	16.54	62.96

NOTES: HK-HK: Hong Kong bride and Hong Kong groom; mainland–HK: mainland bride and Hong Kong groom; HK–mainland: Hong Kong bride and mainland groom.

3.2. *Cross-Border Marriage Matching between HK and Mainland China.* Labor migrations do not drive the cross-border marriages between HK and mainland China. First, the HK government abolished the Touch Base Policy on October 24, 1980. Illegal immigrants arriving on or after October 24, 1980, were repatriated immediately, and carrying their Identity Cards in public areas became compulsory for HK residents. Since then, labor migration from mainland China to HK has been rare (Bacon-Shone et al., 2008). Second, HK residents working in mainland China are unlikely to drive the general trend of the increase in cross-border marriages. Table 1 reports the occupational distribution of HK grooms and brides by marriage types. It shows HK men involved in cross-border marriages are widely distributed across all occupations (column 2). Finally, the labor-force participation rate of mainland women who migrate to HK under the OWP scheme is as low as 29% (Chou, 2009; Chou et al., 2011).

The majority of HK grooms and mainland Chinese brides know each other through marriage brokers, dating Web sites, and relatives. According to a survey on new immigrants under the OWP scheme that was carried out in 2011, 37% of the mainland Chinese brides meet their HK grooms through marriage brokers, 21% through dating Web sites or instant messaging communication software, and 26% through relatives.[16]

3.3. *Spousal Characteristics of Cross-Border Marriages.* We next consider the attributes of agents involved in cross-border marriages between residents of mainland China and HK. Recalling that residents of mainland China who engage in cross-border marriages cannot migrate to HK immediately after marriage, we cannot access their information at the micro level. However, we can check the aggregate statistics on the spousal characteristics of cross-border marriages by residence type as reported by the HK Marriage and Records Office (CSD, 2007). We check two types of spousal characteristics: age and education. Table 2 summarizes the median age at marriage by sex and residence of spouse for all marriages registered in HK in 2006. Traditionally, Chinese husbands are, on average, two to three years older than their wives. Columns 1 and 4 confirm this traditional protocol with respect to the two marriage types of HK bride–HK groom and mainland bride–mainland groom. With regard to mainland bride–HK groom marriages, the husbands are, on average, nine years older than their wives (column 2). By contrast, the husbands are, on average, younger than their wives in HK bride–mainland groom marriages (column 3).[17]

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[16] See Chau (2013) for a detailed description of the survey.

[17] Figure A8 in the online appendix shows the proportion of marriages registered in HK by residence of spouse and difference in age. Among the four marriage types, mainland bride–HK groom has the largest proportion of marriages

TABLE 2
MEDIAN AGE AT MARRIAGE BY RESIDENCE OF SPOUSES, 2006

| | Marriage Types by Residence of Spouses | | | | |
	HK Bride HK Groom (1)	Mainland Bride HK Groom (2)	HK Bride Mainland Groom (3)	Mainland Bride Mainland Groom (4)	Total (5)
Groom	32.0	38.7	26.9	28.4	33.1
Bride	29.5	28.8	27.2	26	29.4

NOTES: The statistics only include all marriages registered in Hong Kong in 2006.
Data source: Bacon-Shone et al. (2008).

TABLE 3
DISTRIBUTION OF EDUCATION ATTAINMENTS BY RESIDENCE OF SPOUSES, 2006

| | | Residence of Spouses (%) | | | | |
Education Attainment	Sex	HK Bride HK Groom	Mainland Bride HK Groom	HK Bride Mainland Groom	Mainland Bride Mainland Groom	Total
Primary or below	Groom	5.60	25.80	36.00	32.70	15.80
	Bride	6.90	38.60	28.00	34.10	20.80
Secondary	Groom	76.00	71.90	61.70	63.50	73.30
	Bride	78.80	60.60	70.60	62.60	71.10
Tertiary (nondegree)	Groom	11.80	1.50	1.40	2.00	7.00
	Bride	9.30	0.50	0.90	1.90	5.30
Tertiary (degree)	Groom	6.60	0.80	0.90	1.70	3.90
	Bride	5.00	0.30	0.60	1.40	2.80

NOTES: The statistics only include all marriages registered in Hong Kong in 2006.
Data source: Bacon-Shone et al. (2008).

Table 3 tabulates the distribution of the educational attainments of the grooms and brides who married in HK by residence of spouses in 2006. Cross-border marriages mainly involve individuals with low and middle levels of education, and most of them have not attained tertiary education.[18] We do not have information on the income of individuals who are involved in cross-border marriages. But we know the economic gap between mainland China and HK was significant in the 1990s. For example, when HK was handed over to mainland China in 1997, the GDP per capita was US$27,055 in HK, in contrast to the US$770 in Mainland China and US$1,800 in Guangdong (National Bureau of Statistics [NBS], 1998).[19]

The aggregate statistics on spousal characteristics in Table 1 clearly display a geographic manifestation of hypergamy. Although the motivation for cross-border marriage is multidimensional, the aggregate statistics show that age is an important factor. Given the huge population pool in mainland China, HK males who are involved in cross-border marriages may want and are able to find younger women. This fact leads to the marriage of young women in the poor region with old men in the rich region. These observations will be incorporated into our theoretical analysis.

with the brides younger than the grooms by at least five years. By contrast, HK bride–mainland groom has the largest proportion of marriages with the brides older than the grooms by at least five years.

[18] Figure A9 shows the proportion of marriages registered in HK by residence of spouses and difference in educational attainment. Among the four marriage types, mainland bride–HK groom has the largest proportion of marriages with better educated grooms. Conversely, HK bride–mainland groom has the largest proportion of marriages with better educated brides. However, these differences may be also caused by a general education gap between mainland and HK. In HK census 2001, the average schooling years for males and females are 11.12 and 10.82, respectively, in the age cohort 24–55. They are 9.44 and 8.24 for male and female residents of Guangdong in mainland Chinese census 2000.

[19] One should be careful in interpreting the summary statistics on the marriage type of mainland bride–mainland groom in Tables 2 and 3, because these marriages were only registered in HK. These grooms and brides were a special group of mainland residents, who may not be representative of the new marriage spouses in mainland China.

4. THE MODEL

The purpose of the model is to explain the main forces that generate cross-border marriages and to identify the agents most likely to engage in such marriages. We use a simple framework of transferable utility and a continuum of agents that allows us to map from given distributions of male and female attributes to the matching patterns that would arise before and after the reduction in the costs of cross-border marriages between the two regions.

4.1. *Marital Attributes.* We define in each region a male attribute m_i for man i and a female attribute f_j for woman j. These attributes are derived from some basic traits such as age and income. Specifically, we assume

$$(1) \qquad\qquad m_i = A(age_i, y_i, \varepsilon_i),$$

$$(2) \qquad\qquad f_j = B(age_j, y_j, \varepsilon_j),$$

where y measures income (or wealth) and ε is a random variable that researchers do not observe but that agents do, such as beauty or intelligence. Although we call these two equations attribute functions, the mapping from age, y, ε to m or f reflects the mating preference in the marriage market. Each attribute is an attractiveness or ability index. Specifically, both attribute functions $A(age_i, y_i, \varepsilon_i)$ and $B(age_j, y_j, \varepsilon_j)$ rise in income, but age has different nonmonotonic effects on men and women. Given the cultural similarity between HK and mainland China, we may assume that all HK and mainland China men rank all HK and mainland China women in a same way and vice versa. So, we basically assume that the attribute functions are the same in the two regions. However, the distributions of the underlying traits can be quite different. Specifically, although the age distribution is similar, the distribution of income in HK dominates that of mainland China.[20] This formulation is flexible enough to allow asymmetry by gender. Importantly, the effects of age may have opposite signs for men and women, and wealth may be a more important trait for men than for women. Because men usually take on the family's financial responsibility, wealth is more important for men in producing marital outputs. By contrast, because women give birth to children and the reproductive window is shorter for women, age is a more important trait for them.[21] Allowing gender-asymmetric attribute functions is consistent with the observed patterns of the spousal characteristics of agents involved in cross-border marriages that we discussed in the previous section.[22]

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 (pooling both HK and mainland men), because they have lower income (y). This is not necessarily true for mainland women because wealth is less important for women than men. If the cost of cross-border marriages is not too high, a demand for mainland brides exists in HK, in particular, for the young brides. By contrast, the demand for mainland grooms is lower than for the brides. Therefore, the observed hypergamy in cross-border marriages can originate from the gender-asymmetric attribute functions and the very different distributions of the traits between the two regions.

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[20] Subsection A.2.2 in the online appendix discusses the differences in the distributions of both age and wages between HK and mainland China.

[21] Siow (1998) explores the economic implications of the gender difference in fecundity.

[22] Table 2 shows age is an important factor for HK men who marry mainland women. Comparing HK brides–HK grooms with mainland bride–HK grooms in the table, we find the median mainland bride is younger than the HK counterpart, and the median HK groom who marries a mainland bride (instead of an HK bride) is older. Further, among the four marriage types, Figure A8 in the online appendix shows that mainland bride–HK groom has the largest proportion of marriages with younger brides. In terms of education, Figure A9 shows that mainland bride–HK groom combination has the largest proportion of marriages with better educated grooms.

4.2. *The Autarky Marriage Market.*   We first consider a situation without cross-border marriages, such that each region is an autarkic marriage market. When a man with attribute m and a female with attribute f get married, their attributes are combined to generate a single marital good according to the household production function $h(m, f)$. We further assume the utility of a single individual equals his or her marital attribute m or f so that the marital surplus is $h(m, f) - m - f$. The produced marital good can be divided between partners so that the utility is *transferable* between them.[23]

The household production function is assumed to be supermodular, indicating the complementarity of the male and female attributes.[24] This important feature can be rationalized by the use of public goods or increasing returns in the household production function (Weiss, 1997).[25] Becker (1973) first showed that complementarity within the household induces a positive assortative match in the marriage market at large, implying

(3) $$1 - F(m) = r(1 - G(f)),$$

where $F(\cdot)$ and $G(\cdot)$ are the cumulative distribution functions of the attributes for males and females, respectively, and r is the ratio of women to men.

For simplicity, we assume uniform distributions for the male and female attributes in each region such that $m \sim [a, a + \delta]$ and $f \sim [b, b + \delta]$. We assume that under autarky, both regions have more men than women ($r < 1$), implying all women are married and some men are single.[26] We denote the lowest married man by $m_0 = a + \delta(1 - r)$.

Given the uniform distributions that we assume, the assignment profiles are *linear* and given by

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

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

When man m is married to woman f, we denote the shares of the man and woman as $u(m)$ and $v(f)$, respectively. Given that $h(m, f) = u(m) + v(f)$, the shares satisfy[27]

(6) $$u(m) = m_0 + \int_{m_0}^{m} h_m(t, \psi(t))dt,$$

(7) $$v(f) = h(m_0, b) - m_0 + \int_{b}^{f} h_f(\phi(s), s)ds,$$

where h_m and h_f are the *marginal* contributions of man m and female f to the marriage. The equilibrium shares agents receive reflect the fact that each man has a very close substitute for each woman he may choose, and the same holds for each woman. Having assumed that $r < 1$ and that singles consume their own "income," the "last" married man should have no

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[23] This assumption allows us to have a meaningful concept of aggregate welfare in terms of a common cardinal presentation of preferences.

[24] For example, a convenient supermodular form is

$$h(m, f) = m + f + mf.$$

[25] Boulier and Rosenzweig (1984) and Behrman et al. (1994) provide supportive empirical evidence. See also Choo and Siow (2006, 2007) and Choo (2015) for the estimation of the transferable utility model of the marriage market.

[26] Although the sex ratio at birth is balanced, a shortage in women always occurs in the marriage market. See the discussions in Siow (1998). One major reason is that women have a shorter reproductive window than men.

[27] For the derivation of the results, see section 8.2.1 in Browning et al. (2014).

rent such that $u(m_0) = m_0$. The woman who marries m_0 reaps all the marital surplus such that $v(b) = h(m_0, b) - m_0$.

When more women are available and r increases marginally, fewer men are single and m_0 declines. Then an increase in r reduces the utility of all women and increases the utility of all married men.[28]

4.3. *Cross-Border Marriages: A Basic Setup.* We now consider HK and mainland China as two marriage markets with possible migration between them.[29] To motivate the asymmetric cross-border movement from mainland China to HK, we assume different distributions of traits in the two regions. To simplify, we assume the same scale parameter δ but different lower bounds in the two regions, so that all four distributions for males and females are *linear shifts of each other*. Specifically, we set

$$(8) \qquad\qquad a_h + \delta > a_c + \delta \geq a_h,$$

$$(9) \qquad\qquad b_h + \delta > b_c + \delta \geq b_h,$$

where the subscript h stands for HK and the subscript c stands for mainland China. We thus assume the top men (women) in HK are better than the top men (women) in mainland China who are, however, better than the HK men (women) at the bottom of the distribution. Furthermore, to explain the gender asymmetry in cross-border marriages, we assume the gap in the lower bound between HK men and mainland China men is larger than the gap in the lower bound between HK women and mainland China women: $a_h - a_c > b_h - b_c$. In order to simplify further, we assume the same sex ratio in the two regions in the autarky state $r_h = r_c = r < 1$. Thus, in both regions, all women are married and some men are single. We recognize that mainland China has a much larger population than HK and thus normalize the population of men in HK to 1 and of HK women to r and set the corresponding populations of men and women in mainland China to σ and $r\sigma$, where $\sigma >> 1$.

We take into account costs of waiting, which are associated with the OWP scheme. During proportion w of time, the newly married partners live separately, applying for the OWP. After obtaining the OWP, the partners live together during the remaining proportion $1 - w$ of the time.

Agents in each region are identified by their marital attributes. We denote by m_h (m_c) a male in HK (mainland China) with endowment m, and by f_h (f_c) a woman in HK (mainland China) with endowment f. We then write the marital output of a cross-border marriage as

$$(10) \qquad\qquad w(m_h + f_c) + (1 - w)h(m_h, f_c).$$

In our analysis, we assume that, because of its population size, emigration does not affect the marital shares of women from mainland China. However, the marital shares of HK men, $u_h(m_h)$, and of HK women, $v_h(f_h)$, can change when the cross-border restriction is reduced. Specifically, if the entry of women from mainland China to HK is sufficiently large to cause some HK women to become single, the marital share of HK men in local marriages will rise and they will become less willing to marry women from China. Therefore, we focus here only on the ex ante demand for cross-border marriages at the time of the change in the policy.[30]

Taking the autarky shares in both HK and mainland China as given, a necessary condition for a cross-border marriage between a woman in mainland China and a man in HK is that the

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[28] See Becker (1991) and Browning et al. (2014).

[29] To be consistent with the empirical analysis, we consider marriage migration only, because labor migration between HK and mainland China was highly restricted during the period we study.

[30] Deriving the ex post shares jointly with the associated marriages that will form in the equilibrium is a difficult numerical problem that is beyond the scope of this article.

newly formed marriage covers at least the sum of the utilities received by the two partners in their marriage in the autarkic case

$$(11) \qquad w(m_h + f_c) + (1 - w)h(m_h, f_c) \geq u_h(m_h) + v_c(f_c).$$

This condition is necessary; otherwise, at least one partner will be worse off in the new marriage. A similar condition applies to cross-border marriages between HK women and men from mainland China. However, based on the observed data, we will focus on cross-border marriages of HK men to women from mainland China, assuming only such cross-border marriages take place.

We are interested in the pattern of cross-border marriages that form when marriage immigration becomes possible. Starting with autarky in both mainland China and HK, the marital shares of married men in HK are given by

$$(12) \qquad u_h(m_h) = m_{h,0} + \int_{m_{h,0}}^{m_h} h_{m_h}(t, \psi(t))dt,$$

whereas the marital share of married women in mainland China is

$$(13) \qquad v_c(f_c) = h(m_{c,0}, b_c) - m_{c,0} + \int_{b_c}^{f_c} h_{f_c}(\phi(s), s)ds,$$

where $m_{\tau,0} = a_\tau + \delta(1 - r)$ $(\tau = h, c)$.

To determine who will be involved in cross-border marriage in equilibrium, we first look at who can be potentially involved in cross-border marriages. Potential assortative matching occurs between HK men and mainland Chinese women; starting from the top of the female distribution in mainland China and the top of the male distribution in HK implies[31]

$$(14) \qquad r\sigma \left(\frac{b_c + \delta - f_c)}{\delta} \right) = \frac{a_h + \delta - m_h}{\delta}.$$

Hence, the prospective mainland wife of man m_h in HK is

$$(15) \qquad f_c(m_h) = \delta + b_c + \frac{m_h - \delta - a_h}{r\sigma}.$$

Rewriting the necessary condition (11) as

$$(16) \qquad w(m_h + f_c(m_h)) + (1 - w)h(m_h, f_c(m_h)) \geq u(m_h) + v(f_c(m_h))$$

will guarantee it is also a sufficient condition because, by construction, the match between m_h and $f_c(m_h)$ cannot be blocked by another cross-border match, because m_h is already matched to the best Chinese women he can get.[32] This condition also guarantees that the mainland Chinese woman $f_c(m_h)$ can be "bribed" by man m_h to move to HK and form a cross-border marriage with him.[33]

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[31] The possibility that cross-border marriages may involve the best women in mainland China seems counterintuitive. This counterintuitive result might be caused by our omission of the consideration of the labor market. The labor force participation rate for mainland women marrying HK residents has been very low. Therefore, the opportunity cost from the labor market is highest for the best women in mainland China. Taking the labor market consideration into account would greatly complicate our model. However, we consider that this discrepancy is not very relevant, given that the analysis mainly focuses on impacts in HK instead of in China.

[32] See Roth and Sotomayor (1992, ch. 1)

[33] Note further that woman $f_c(m_h)$ cannot use the offer from m_h to raise her share in mainland China because a very close substitute for her is in mainland China.

4.4. *Cross-Border Marriages: A Simplified Case.* Given its complexity, the model outlined above does not yield an analytically tractable solution.[34] We therefore simplify our model by assuming that following the reduction in entry cost, an exogenous mass of young women from mainland China try to enter HK via cross-border marriages. Moreover, these women have a common outside option in mainland China.[35] Specifically, we assume $v_c(f_c(m_h)) = v$ for all injected women from mainland China to HK.[36] These simplifying assumptions can be justified as follows: The population size (mass) of mainland Chinese women is huge. The number of mainland Chinese women involved in cross-border marriages is very small for mainland China, but very large for HK. Referring to Equation (15), if σ is sufficiently large, $f_c(m_h) \approx \delta + b_c$, which is a constant. Thus, (1) the emigration of these women will not affect the distribution of marital payoffs of the Chinese people as in the autarky case. (2) These women constitute just one point (snapshot) of the distribution of women in mainland China. We thus assume they are homogeneous and have the same payoff as in the autarky case, which we denote by v. (3) The injection of Chinese women is large enough to change the sex ratio in HK, which shifts to $r_h > 1$ after the cross-border marriages.[37] Admittedly, the case we consider is a special one with some strong assumptions. But this special case is tractable and maintains the main features of cross-border marriages between HK and mainland China. Subsection A.2 of the online appendix discusses a more general case with weaker assumptions and the simulation results.

Denote the cross-border marital outputs as $l(m_h, w) = w(m_h + f_c) + (1 - w)h(m_h, f_c)$, and the opportunity cost of cross-border marriages as $s(m_h) = u(m_h) + v$. We first observe that both $l(m_h, w)$ and $s(m_h)$ monotonically increase with m_h such that $\partial l(m_h, w)/\partial m_h > 0$ and $\partial s(m_h)/\partial m_h > 0$. $\partial l(m_h, w)/\partial w < 0$ as $h(m_h, f_c)$ is supermodular such that $h(m_h, f_c) > m_h + f_c$. We also observe that in one extreme case when $w = 1$, $l(m_h, 1) < s(m_h)$ for all m_h. The reason is that, if $w = 1$, on the one hand, $v > f_c$; on the other hand, $u(m_h) > m_h$ when $m_h > m_{h,0}$, and $u(m_h) = m_h$ when $m_h \leq m_{h,0}$.

In the other extreme case when $w = 0$, there exists a unique best HK man involved in cross-border marriages as $m_{h,1}$, such that $l(m_h, 0) > s(m_h)$ when $m_h < m_{h,1}$, $l(m_h, 0) < s(m_h)$ when $m_h > m_{h,1}$, and $l(m_{h,1}, 0) = s(m_{h,1})$.[38] The reason is as follows: (1) $a_h < m_{h,0} < m_{h,1}$ because $l(m_h, 0) > s(m_h)$ when $m_h \leq m_{h,0}$, where $m_{h,0}$ is the last married HK man in the autarky case. (2) $m_{h,1} < a_h + \delta$ because we assume the quality of the top HK woman is sufficiently higher than that of the top mainland Chinese woman (Equation (9)). (3) $\partial s(m_h)/\partial m_h - \partial l(m_h, 0)/\partial m_h > 0$ when $m_h = m_{h,1}$.[39] Thus, supposing the x-axis is m_h, there exists a unique $m_{h,1}$ at which the two lines $l(m_h, 0)$ and $s(m_h)$ intersect. See Figure A10 in the online appendix for a numerical illustration.

We can thus pin down an equilibrium when w is sufficiently low such that $w < w^*, m_{h,1} > m_{h,0}$. w^* is determined by the following condition:

$$(17) \qquad w(m_{h,0} + f_c) + (1 - w)h(m_{h,0}, f_c) - m_{h,0} - v = 0.$$

[34] A full solution should jointly determine the autarky shares and the entry of women from mainland China, which are interrelated. For instance, if the entry of women to HK is sufficiently large to cause some HK women to become single, the marital share of HK men will rise and they will become less willing to marry women from mainland China.

[35] We thank the editor and an anonymous referee for the suggestion. The assumption that the injected women are young is based on Table 2 discussed above. The table shows large age differences in cross-border marriages.

[36] The assumption of exogenous outside-option payoffs is held only for a given period. With the change in economic development of mainland China, the outside-option payoffs for mainland Chinese involved in cross-border marriages may change.

[37] Figure A5 in the online appendix shows that, indeed, more females than males lived in HK in later census years, such as 2001 and 2006, especially for the age group of 20–44.

[38] We assume that $b_c + \delta = b_h$ and $\partial^2 h(m, f)/\partial m^2 \geq 0$.

[39] We present the proof in two steps. First, $f_c < f_h(m_{h,1})$. The reason is as follows. $l(m_h, 0) = s(m_h)$ when $m_h = m_{h,1}$ by the definition of $m_{h,1}$. That is, $u(m_h, f_h(m_h)) + v(f_c) = h(m_h, f_c)$. However, $u(m_h, f_c) + v(f_c) < h(m_h, f_c)$. Because $\partial u(m, f)/\partial f > 0$, we have $f_c < f_h(m_{h,1})$. Second, $\partial s(m_h)/\partial m_h = h_{m_h}(m_h, f_h(m_h)) + \int_{m_{h,0}}^{m_h} \partial h_{m_h}(t, \psi(t))/\partial t dt$, and $\partial l(m_h)/\partial m_h = h_{m_h}(m_h, f_c)$. When $m_h = m_{h,1}, f_c < f_h(m_{h,1})$. Hence, $h_{m_h}(m_h, f_c) < h_{m_h}(m_h, f_h(m_h))$. Furthermore, $\int_{m_{h,0}}^{m_h} \partial h_{m_h}(t, \psi(t))/\partial t dt > 0$. Thus, we have $\partial s(m_h)/\partial m_h - \partial l(m_h, 0)/\partial m_h > 0$ when $m_h = m_{h,1}$.

It means that we could manipulate w such that the two lines $l(m_h, w)$ and $s(m_h)$ intersect above $m_{h,0}$. In this case, the cross-border marriage pattern is as follows. The HK men in the range $[m_{h,1}, a_h + \delta]$ marry the same HK women as in the autarky case, and those in the range of $[a_h, m_{h,1})$ marry mainland Chinese women. The HK women in the range $[f_h(m_{h,1}), b_h + \delta]$ marry the same HK men as in the autarky case. However, those in the range of $[b_h, f_h(m_{h,1}))$ remain single. In this regard, imported women in the HK marriage market replace these local women in this range.

We then examine the effect of the waiting time on the assignment patterns.[40] With an exogenous outside-option payoff for mainland Chinese women, the decrease in cross-border marriage costs increases the number of cross-border marriages. Totally differentiating the equilibrium condition $l(m_{h,1}, w) = s(m_{h,1})$ with respect to w, we have

$$(18) \qquad \frac{\partial m_{h,1}}{\partial w} = \frac{h(m_{h,1}, f_c) - m_{h,1} - f_c}{w + (1-w)f_c - \frac{\partial u_h(m_{h,1})}{\partial m_{h,1}}} < 0,$$

where $w + (1-w)f_c$ is the marginal contribution of m_h to the marital output of the potential cross-border marriage. That is, $w + (1-w)f_c = \partial l(m_h)/\partial m_h$. On the other hand, $\partial u_h(m_h)/\partial m_h$ is the marginal contribution of m_h to the opportunity cost of cross-border marriages. That is, $\partial u_h(m_h)/\partial m_h = \partial s(m_h)/\partial m_h$. Supposing the x-axis is m_h, the two functions $l(m_h)$ and $s(m_h)$ are positively sloped and intersect at $m_{h,1}$. Moreover, $l(m_h) > s(m_h)$ when $m_h < m_{h,1}$, and $l(m_h) < s(m_h)$ when $m_h > m_{h,1}$ by the definition of $m_{h,1}$. Therefore, $\partial s(m_h)/\partial m_h > \partial l(m_h)/\partial m_h$ in the neighborhood of $m_{h,1}$. Figure A10 in the online appendix presents a numerical illustration. So $w + (1-w)f_c - \partial u(m_{h,1})/\partial m_{h,1} < 0$. $h(m_{h,1}, f_c) - m_{h,1} - f_c > 0$ as $h(m, f)$ is supermodular by definition. Thus, $\partial m_{h,1}/\partial w < 0$. Equation (18) shows that a decrease in cross-border marriage costs is associated with more HK men involved in cross-boundary marriages. At the same time, more HK women become single when w decreases.

Equation (18) derives a nice comparative static result on the effect of a marginal change in w on the assignment pattern. However, our empirical analysis involves a discrete decrease in cross-border marriage costs, induced by the increase in the OWP quota and the handover. Specifically, we compare HK residents' marriage behavior between 1990 and 2000. Figure 1 shows that there was almost no cross-border marriages in 1990. By contrast, the share of cross-border marriages in all new marriages registered in HK in 2000 was more than 15%. Therefore, our theoretical analysis below specifically focuses on the comparison between the autarkic case and the cross-border marriage case when $w < w^*$. Our main interest centers on identifying the impact of cross-border marriages on the marriage market and households in HK.

Our first hypothesis summarizes the effect of cross-border marriages on the assignment pattern.

> *Hypothesis 1.* The cross-border marriage, induced by the increase in the OWP quota and the handover, increases males' relative position in the marriage market and correspondingly decreases that of females. Specifically, relative to men, it decreases women's married rates.

Importantly, our model also predicts which segments of the population are affected by cross-border marriages induced by the increase in the OWP quota and the handover. Specifically, women (men) in the upper part of the distribution, $f_h \in [f_h(m_{h,1}), b_h + \delta]$ ($m_h \in [m_{h,1}, a_h + \delta]$), maintain their marriage. Our second hypothesis summarizes this result.

> *Hypothesis 2.* The change in the marital status should be focused on the group at the low tail of the HK attribute distribution, whereas men and women in the top will maintain their marriages.

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[40] So far, we literally interpret w as the waiting time. In reality, w can be broadly interpreted as a searching cost. After the handover, the socioeconomic integration between mainland China and HK could also decrease the searching cost between the two regions, and accordingly w.

Finally, with cross-border marriages, our model also predicts the marital share of all men rises whereas the marital share of all women declines. We distinguish the extensive margin from the intensive margin. The changes in marital share of the three groups, HK men $m_h \in [a_h, m_{0,1})$ and $m_h \in [m_{0,1}, m_{h,1})$ and HK women $f_h \in [b_h, f_h(m_{h,1}))$, are at the extensive margin. Specifically, HK men $m_h \in [a_h, m_{0,1})$ and $m_h \in [m_{0,1}, m_{h,1})$ are better off. The former group changes from being single to being married. The latter group forms better matches with mainland Chinese women, because $l(m_{h,1}, w) > s(m_{h,1})$ when $m_h < m_{h,1}$. HK women $f_h \in [b_h, f_h(m_{h,1}))$ are worse off because they change from being married to being single.

The changes in marital share of the other two groups, HK men $m_h \in [m_{h,1}, a_h + \delta]$ and HK women $f_h \in [f_h(m_{h,1}), b_h + \delta]$ are at the intensive margin. Specifically, the new shares for HK men $m_h \in [m_{h,1}, a_h + \delta]$ and HK women $f_h \in [f_h(m_{h,1}), b_h + \delta]$ are

$$(19) \qquad u(m_h) = h(f_h(m_{h,1}), m_{h,1}) - f_h(m_{h,1}) + \int_{m_{h,1}}^{m_h} h_{m_h}(t, \psi(t))dt,$$

$$(20) \qquad v(f_h) = f_h(m_{h,1}) + \int_{f_h(m_{h,1})}^{f_h} h_{f_h}(\phi(s), s)ds.$$

Compared with the shares in the autarky case (Equations (6) and (7)), Equations (19) and (20) show that HK men $m_h \in [m_{h,1}, a_h + \delta]$ are better off following the injection of mainland Chinese women; at the same time, HK women $f_h \in [f_h(m_{h,1}), b_h + \delta]$ are worse off. The reason is as follows. Before cross-border marriage happens, HK women are in the short side of the autarky marriage market as $r < 1$. Therefore, they reap all the marital "rent" as shown in Equation (7). For example, for the last HK woman married in the autarky case, $f_h = b_h$, her marital share is $h(m_{h,0}, b_h) - m_{h,0}$. As the marital output function is supermodular, $h(m_{h,0}, b_h) - m_{h,0} > b_h$, and she reaps all marital surplus. On the other hand, for the last HK man married, $m_h = m_0$, his marital share is m_0, the same as being single (Equation (6)). By contrast, following the injection of mainland Chinese women, HK men are in the short side of the marriage market. Therefore, they reap all the marital rent as shown in Equation (19). At the same time, HK women lose the marital rent (Equation (20)). Essentially, the change in the intensive margin for these two groups is similar to the change induced by a flipping of the ratio of females to males from $r < 1$ to $r > 1$. When $r < 1$ ($r > 1$), females (males) reap all rents. Our third hypothesis summarizes the result.

> *Hypothesis 3*. The intrahousehold power tilts toward men with the decrease in cross-border marriage costs.

From a welfare perspective, aggregate welfare in HK rises following the entry of women from mainland China, because the optimal assignment profile in the autarky marriage case is still feasible. However, the welfare of all women in HK declines, even for high-quality women who maintain their marriage, because their marital share declines when that of the women below them declines. By a similar logic, the marital share and welfare of all HK men increase.

Before discussing our model implications of the gender-asymmetric cross-border marriages for HK residents' labor market behavior, we argue that the simple matching theory above can well explain the descriptive patterns presented in the background section. First, Table 2 shows that of the four marriage types, the mainland bride–HK groom marriages have the largest husband–wife age gap by nine years. Our theory predicts that with a decrease in cross-border marriage costs, men in HK can choose between local HK women and mainland women. Because mainland women are less educated than local HK women (Table 3), they are more likely to be chosen only if they are young.

Second, Figure 1 shows that the proportion of HK men involved in cross-border marriages rose significantly until 2005 but leveled off between 2005 and 2010, whereas the proportion of HK women involved in such marriages continued to rise mildly. Our model can rationalize these

diverging profiles via a process of replacement of local women by imported women, creating a pool of local single women, which in turn reduces the incentive of HK men to marry more women from mainland China.

4.5. *Model Implications for the Labor Market.* The empirical analysis below focuses on testing the three hypotheses that we derive directly from our model. In addition, we will also examine some indirect testable implications. Behrman (1997) reviews the intrahousehold resource allocation models. Rangel (2006) and Ward-Batts (2008) show empirical evidence on the positive relationship between intrahousehold bargaining power and consumption (leisure). Although we do not directly observe the marital shares that men and women receive in marriage, we expect the changes in the relative position of men and women in the marriage market to affect some observed household outcomes, such as the relative amount of market work husbands and wives perform. Specifically, the decrease in cross-border marriage costs changes the men and women's incentives in the labor market. For example, the female labor-force participation rate increases relative to that of men. Furthermore, the incentive effects are larger for women with low education than for women with high education.[41] In this sense, the effect of the increase in gender-asymmetric cross-border marriages on HK residents' labor market performance is similar to the effect of the decrease in sex ratios. In our case, the change in sex ratio in the HK marriage market is an outcome of gender-asymmetric cross-border marriages induced by the increase in OWP quotas and the handover.

4.6. *The Education Boom as an Alternative Model.* The hypotheses and implications above can be used to compare our theory with an alternative theory that addresses the increase in gender-asymmetric cross-border marriages. The major alternative explanation for the rapid growth of cross-border marriages is the boom of female higher education. Kawaguchi and Lee (2012) argue that developed Asian countries' demand for foreign brides is the consequence of improvement in women's economic status and gender-discriminative household arrangements that insufficiently incorporate women's improved status in marriage. Hwang (2016) concludes that the increase in female education along with stagnated gender attitudes decreases the marriage willingness of highly educated women in Asian societies. Therefore, men in developed Asian countries seek cross-border marriages.

Indeed, women's educational attainments have experienced rapid growth in both developed and developing countries (Chiappori et al., 2009; Becker et al., 2010; Pitt et al., 2012). But this trend has some different implications from those derived from our model. In contrast to Hypothesis 2, the education-boom hypothesis would suggest that the change in marital status should mainly occur within the group with a high education. In contrast to Hypothesis 3, the boom model predicts increases in the power of women because they have more outside options with the increase in female educational attainment.

5. DATA AND EMPIRICAL FRAMEWORK

5.1. *Data.* Our empirical analysis below mainly involves comparisons of the HK marriage market across four census years: 1991, 1996, 2001, and 2006. Almost no cross-border marriages occurred in 1991 (Figure 1). Thus, the main testable implications derived from the model involve comparisons between the case of a closed marriage market under autarky and the case of an open marriage market with cross-border marriages. To examine empirically the consequences of the decrease in cross-border marriage costs in the marriage market, within the household, and in the labor market in HK, we draw on comprehensive census data sets from HK and Taiwan. We first describe these census data sets.

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[41] In the marital-attribute function (Equations (1) and (2)), both age and income determine an individual's quality. This prediction focuses on education because we control for age in the regression analysis below. We then use education as a proxy variable for the individual's potential earning ability.

TABLE 4
DESCRIPTIVE STATISTICS OF MAIN VARIABLES

	Hong Kong		Taipei	
	Men	Women	Men	Women
Marital outcomes				
Currently married	0.605	0.645	0.715	0.773
	[0.489]	[0.478]	[0.451]	[0.419]
Ever-married	0.630	0.698	0.750	0.833
	[0.483]	[0.459]	[0.433]	[0.373]
Currently divorced	0.023	0.040	0.030	0.037
	[0.150]	[0.196]	[0.72]	[0.188]
Intrahousehold outcome				
Household head	0.594	0.191		
	[0.491]	[0.393]		
Labor market outcomes				
Labor force participation	0.946	0.696		
	[0.202]	[0.460]		
Employed	0.958	0.966		
	[0.202]	[0.182]		
Wage income	17.258	14.050		
(HK $1,000)	[18.097]	[13.836]		
Hold a second job	0.026	0.020		
	[0.158]	[0.139]		
Other variables				
Age	37.005	36.943	37.556	37.535
	[8.26]	[8.230]	[8.460]	[8.444]
Schooling years	10.961	10.439	10.841	9.991
	[4.064]	[4.141]	[3.513]	[3.874]
N	199,513	192,909	1,424,651	1,431,891

NOTES: Only local residents are included. The samples include individuals aged 24–55. Standard deviations are in brackets.
Data sources: Hong Kong censuses 1991, 2001, and by-censuses 1996, 2006; Taiwan censuses 1990, 2000.

5.1.1. *HK (by-)censuses: 1991, 1996, 2001, and 2006.* We first derive our data from the 1991 and 2001 HK population censuses and the 1996 and 2006 by-censuses. HK conducts a population census once every 10 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 by-censuses. Thus, each of the four samples contains 5% of the HK population in the census or intercensus year. In forming these four samples, the HK Census and Statistics Department has ensured 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 behavior.

We restrict our sample to HK residents who were born in HK and were ages 24–55 in the census year.[42] Most of the immigrants to HK during the past two decades have arrived through cross-border marriages between residents of mainland China and HK. Cross-border marriages are endogenous outcomes; hence, including immigrants that arrived through cross-border marriages may generate a selected sample. Furthermore, the sample that includes these immigrants is truncated because some mainland partners of HK residents had not migrated to HK at the census survey time.

Table 4 reports the descriptive statistics for the main variables. To test Hypotheses 1 and 2, we use three variables to measure marital outcomes: currently married, ever-married, and currently divorced.[43] To test Hypothesis 2 regarding the relative decision power of husband

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[42] Most individuals would complete their college after age 23.

[43] Using the variables newly married and newly divorced to measure the change in marital status in response to the policy change is preferable. The HK censuses do not provide information on marriage year, but in the age group we

and wife, we use a dummy variable of being a household head as a proxy for intrahousehold power. It is an appropriate proxy variable. As 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." We include only married couples who were born in HK in the analysis of the intrahousehold power.[44] Because the by-census 2006 codes the household head differently from others, we drop this by-census in our analysis with respect to intrahousehold power. Only one head is reported in each household in censuses 1991 and 2001 and by-census 1996, whereas multiple heads in a household can be reported in by-census 2006. To examine the incentive effects of the decrease in cross-border marriage costs on the labor market, we construct four labor market outcomes: labor-force participation, employment status, wage,[45] and whether the individual holds a second job.

5.1.2. *Taiwan censuses: 1990 and 2000.*   In our empirical analysis, we use Taiwan residents as a comparison group. Therefore, we supplement the HK censuses with Taiwan censuses. Similar to HK, Taiwan conducts a population census once every 10 years. The two recent censuses were conducted in 1990 and 2000. 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. Two points should be noted regarding the use of the Taiwan censuses. First, to ensure comparability between the treatment and the comparison group, we choose only one city in Taiwan, Taipei. Second, we restrict our sample to local Taipei residents. Table 4 also reports the summary statistics based on the 1990 and 2000 Taiwan census data. Similar to the HK censuses, the Taiwan censuses contain the same three variables that measure marital status. However, the Taiwan censuses do not contain information on individuals' labor market outcomes as in the HK censuses.[46]

5.2. *Empirical Framework.*   Structurally estimating the model is beyond the scope of the article because of data limitations. No documentation of cross-border marriage data exists at the individual level. Moreover, because the mainland spouses of HK residents in new marriages are unable to migrate to HK immediately, they are not enumerated in the census at the time of the new marriage. More modestly, we test the theoretical predictions just described in reduced form. Specifically, we empirically test the effects of the decrease in the cost of waiting time w, because the OWP scheme and the handover directly affect it.

Our econometric analysis involves cross-time, cross-gender, and cross-region variations in the differential treatments of the increase in the OWP quota and the handover. With all the necessary controls, estimating the effects of the policy changes and the handover suggests a causal relationship between the decrease in cross-border marriage costs and marriage and labor market outcomes in HK. The increase in the OWP quota directly reduces the cost, and the handover may also considerably facilitate cross-border activities and decrease cross-border marriage searching costs.

Specifically, our first regression equation is a DD estimator that explores the richness of the four waves of HK census and by-censuses (1991, 1996, 2001, and 2006):

$$(21) \qquad Y_i = \alpha_0 + \alpha_1 female_i + \alpha_2 T_i + \alpha_3 female_i * T_i + X_i \alpha_4 + trend + u_i.$$

The dependent variable Y measures the marital, intrahousehold, or labor market outcome of individual i. The independent variable *female* indicates the individual's gender. It is equal

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use, 22–55, death is negligible. Thus, the difference-in-differences estimates of the currently married, ever-married, and currently divorced that we employ reflect mainly new marriages and new divorces.

[44] The HK censuses do not contain information on household expenditure or individual consumption. Thus, household head is the only variable we can use to measure the relative decision power of husband and wife.

[45] We only include the wage from the primary job.

[46] The definitions of household head are different between HK and Taiwan censuses. So we do not use the information on household head in Taiwan censuses.

to 1 if the individual is female; otherwise, it equals 0. We use the variable T to indicate the posttreatment period. T equals 1 if the census year is 2001 or 2006 and 0 if the census year is 1991 or 1996. As discussed earlier, the increase in the OWP quota and the handover of HK to China in 1997 serve as quasi-natural experiments in reducing the cost of cross-border marriages. We classify the census year 1996 as the pretreatment period. The OWP quotas increased to 150 in 1995. But because of the waiting time, the mainland individuals who migrated to HK in 1995 actually married local residents several years before. Furthermore, the 1995 policy relaxation did not affect the local marriage market in 1996, because it would take time to generate any visible effects. HK residents would need time to find mainland Chinese spouses. Thus, the effect of cross-border marriages may be lagged by one or two years.[47] X is a vector of variables that measure the individual's characteristics, such as age, age squared, and schooling years. *trend* is a survey year trend. u is the error term.

We are interested in the estimated coefficient α_3 in Equation (21). The estimated coefficients of α_1 and α_2 pick up the gender and time-period differences in individual outcomes. The estimated α_3 thus measures the changes in the gender differences in outcomes across the change in the OWP quota and the handover. The basic idea behind the estimation of Equation (21) is to examine whether cross-gender and cross-census changes in the marriage and labor market behavior are related to the cross-census changes in the gender-asymmetric cross-border marriages, induced by the discrete increases in the OWP quotas and the handover. So, the identification assumption is that, without the changes in the OWP quotas and the handover, the changes in HK men and women's marital, intrahousehold, and labor market behavior would be the same between 1991–96 and 2001–2006 after controlling for the time trend. Under this assumption, the estimates of α_3 allow us to test Hypotheses 1 to 3 and other implications derived from our model. For example, to test hypothesis 1, we use the indicator of being currently married as the dependent variable. Hypothesis 1 then predicts α_3 is negative. To test Hypothesis 2, we estimate Equation (21) using the highly and lowly educated subsamples, respectively. For example, if we use currently married as a dependent variable, Hypothesis 2 predicts that the magnitude of α_3 (in terms of the absolute value) is larger for the lowly educated subsample.

The endogeneity in the implementation of policies in quasi-experimental studies (Meyer, 1995) may be less of a concern in our study. As discussed in the "Background" section, the mainland government controls and implements the OWP scheme. Therefore, policy changes in the OWP should be plausibly exogenous to the social and economic factors in HK. The 1997 handover of HK to mainland China was stipulated in the Convention for the Extension of Hong Kong Territory in 1898 and was scheduled in the Sino-British Joint Declaration of 1984. Therefore, an endogenous choice is unlikely to exist in the discrete changes in the OWP quota and the handover.

We now examine the common trend assumption used in the DD estimator. Panels (a)–(c) in Figure 3 show the proportion of persons who are currently married, ever-married, and currently divorced by gender in HK across censuses 1991, 1996, 2001, and 2006. We see that the gender differences in the currently married, ever-married, and currently divorced rates changed little from 1991 to 1996. However, we see a clear gender-divergent pattern since 1996. For example, the currently married rate experienced a substantial increase for males. Conversely, for females, the currently married rate decreased.[48] Given that (1) both the sex ratio at birth (Figure A6 in the online appendix) and the sex ratio of the residents born in HK (Figure A7) have been stable and balanced in the past decades, and (2) marriage is a one-to-one match,

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[47] Our empirical results remain almost the same after dropping the 1996 census from the estimation sample.
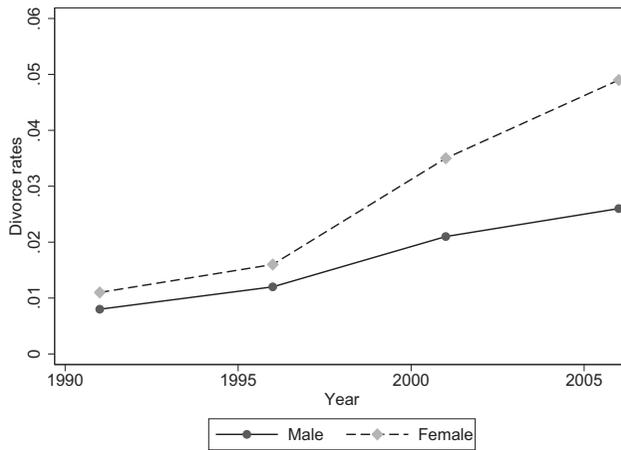
[48] Note the currently married rate for males surpassed that for females in the 2006 by-census (panel (a)), although historically, the currently married rate for the females has been higher than that for males across almost all societies (Becker, 1991).
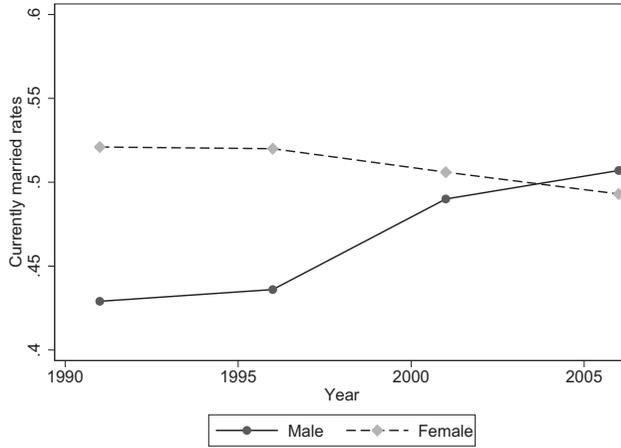
(a) Currently married rates
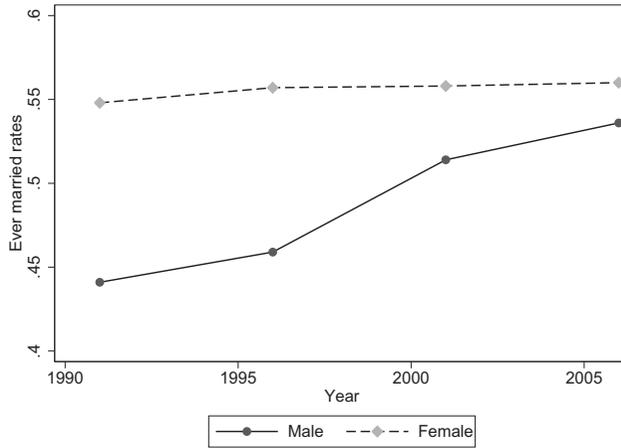
(b) Ever-married rates

(c) Divorce rates

FIGURE 3

THE FRACTION OF PERSONS AGED 16–65 WHO WERE BORN IN HONG KONG AND WERE CURRENTLY MARRIED, EVER MARRIED, OR DIVORCED, BY YEAR AND BY GENDER, 1991–2006

cross-border marriages can explain these gender-divergent trends in the marriage status across HK residents since 1996.[49]

As a robustness check, our second regression equation is a triple-difference estimator using Taipei as a comparison group:

$$(22) \qquad Y_i = \beta_0 + \beta_1 HK_i + \beta_2 T_i + \beta_3 female_i + \beta_4 HK_i * T_i + \beta_5 HK_i * female_i$$
$$+ \beta_6 T_i * female_i + \beta_7 HK_i * T_i * female_i + X_i \beta_8 + trend + \epsilon_i,$$

where the dependent variable Y measures individual $i's$ marital status. We use HK 1991 and 2001 censuses and 1996 and 2006 by-censuses and Taiwan 1990 and 2000 censuses in estimating Equation (22). Taipei residents serve as a comparison group. Therefore, the independent variable HK is equal to 1 if the individual is an HK resident, whereas it is equal to 0 if the individual is from Taipei. We use T to indicate the posttreatment period, which is equal to 1 if the individual is included in the HK 2000 census, the 2006 by-census, or the Taiwan 2000 census. If the individual is included in the 1991 HK census, the 1996 by-census, or the 1990 Taiwan census, T is equal to 0. The variables $female$ and $trend$ and the vector X are defined in the same way as in Equation (21). ϵ is an error term.

The coefficient of primary interest is β_7. It measures the cross-regional, cross-time, and cross-gender changes in the outcomes driven by changes in gender-asymmetric cross-border marriages. If we assume that, without the discrete changes in the OWP quota and the handover, the gender difference between HK and Taipei local residents shares the same time trend of marriage behavior, β_7 has a causal interpretation. Furthermore, the estimate of β_7 provides us with direct tests of Hypothesis 1. For example, if we use the indicator of being currently married as the dependent variable, Hypothesis 1 predicts that β_7 is negative. To test Hypothesis 2, we estimate Equation (22) by using the highly and lowly educated subsamples, respectively. For example, if we use currently married as a dependent variable, Hypothesis 2 predicts that the magnitude of β_7 is more negative for the lowly than for the highly educated subsample.

We believe Taipei residents serve as a reasonably good comparison group for HK residents for several reasons: First, Taipei, HK, and the mainland share the same Chinese cultural background. Second, the Taipei government did not change its marriage immigration policies during the 1990s. Although it strengthened its immigration policies to discourage marriage immigration in 2004, this change does not affect our empirical analysis, because we only use Taipei census 2000 as the posttreatment period. Third, Taipei and HK experienced similar macroeconomic fluctuation during the 1990s, such as the 1997 East Asian financial crisis. Fourth, mainland China has been the dominant region for both Taipei and HK residents to source brides.

The identification assumption in estimating Equation (22) is that HK and Taipei residents share the same trend of gender difference in marriage behavior. We now examine this common trend assumption. Figure 4 depicts the gender differences in currently married rates (males minus females) in HK and Taipei, respectively, during our study period. We find HK and Taipei residents indeed share the same trend of gender difference in currently married rates during the pretreatment period between 1980 and 1990.[50] This result validates Taipei as a good comparison group for HK in our empirical analysis.

Despite the good reasons and statistical support that favor our identification strategy of using Taipei as a comparison group, we exercise two cautions. On one hand, both Taipei and HK source brides from mainland China, which may lead to some potential general equilibrium effects. We argue that these potential general equilibrium effects may not be a main threat to our identification strategy. The official languages in HK are English and Cantonese. Thus, about 86% of the brides are from Guangdong, the province neighboring HK (Bacon-Shone et al.,

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[49] We also control for the time trend because we have two periods before the treatment. Controlling for time trend is valuable in the quasi-experimental studies using the DD estimator (Meyer, 1995).

[50] Unfortunately, Taiwan does not have by-census, so we cannot be sure of the gender difference for Taipei around 1995.
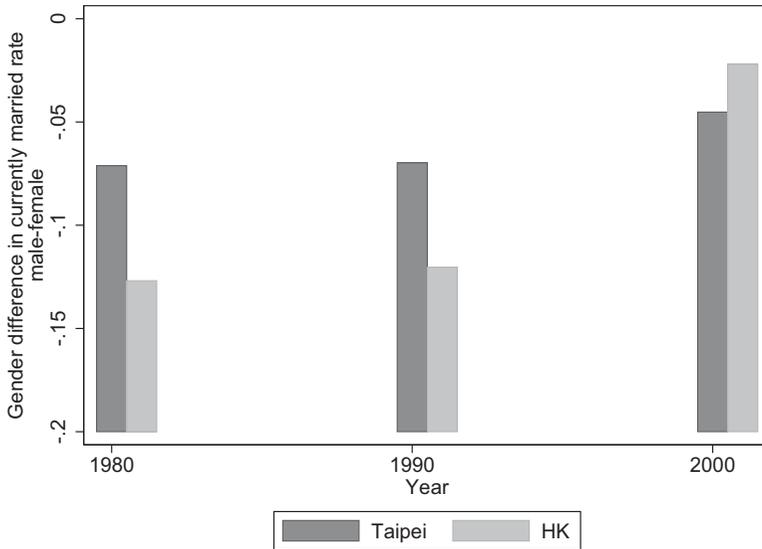
2008). Guangdong is one of the two provinces in China where the residents speak Cantonese. By contrast, the main languages in Taiwan are hokkien and mandarin, and thus the majority of brides are from Fujian province, where the residents speak hokkien. Although HK and Taipei source brides from different provinces in China, the general equilibrium effect may still exist. For example, if women in Guangdong and Fujian provinces marry HK and Taipei men, men in Guangdong may compete with Fujian men by sourcing brides from other provinces in China. These potential general equilibrium effects may be small considering the huge population size in mainland China relative to that in HK or Taipei.

On the other hand, Figure 4 shows that relative to the rate for females, the males' currently married rate increased by more than 10 percentage points in HK in the 1990s. During the same period, the males' currently married rate relative to females increased by about 2 percentage points in Taipei. Our DD estimates can thus be interpreted as a lower bound of the effects of the reduction in cross-border marriage costs on the marital outcomes in HK.

In summary, guided by the theoretical model, the objective of our empirical analysis is to systematically examine the general pattern of changes in the marriage market, intrahousehold, and labor market behavior between the male and female HK residents and to relate these to the decrease in cross-border marriage costs induced by the increase in the OWP quota and the handover. Our empirical analysis provides us with an opportunity to not only test the hypotheses derived from our theoretical model, but also to distinguish them from the hypothesis derived from the alternative boom hypothesis in explaining the increase of cross-border marriages.

6. EMPIRICAL RESULTS

6.1. *Marital and Intrahousehold Outcomes.* This subsection reports our main empirical results on testing Hypotheses 1–3. Table 5 presents the DD estimates of Equation (21). These estimates capture the gender differences in outcomes after the discrete increases in the OWP quota and the handover. The top panel shows that, compared with the rates for men, HK women's currently married and ever-married rates decreased by 8.8 and 6.8 percentage points, respectively, whereas their currently divorced rate increased by 1.8 percentage points following the decrease in cross-border marriage costs induced by the increases in the OWP quota and the handover. All estimates are statistically significant at least at the 1% level (column 1). These

TABLE 5
CROSS-BORDER MARRIAGES AND THE GENDER DIFFERENCES IN FAMILY BEHAVIOR OF HONG KONG RESIDENTS

	The Whole Sample (1)	Highly Educated (2)	Lowly Educated (3)
	Marital outcomes		
Currently married	−0.088***	−0.025	−0.087***
	[0.020]	[0.023]	[0.020]
Ever-married	−0.068***	−0.020	−0.062***
	[0.018]	[0.021]	[0.017]
Currently divorced	0.018***	0.006*	0.021***
	[0.003]	[0.003]	[0.003]
	Intrahousehold outcome		
Household head	−0.085***	−0.089**	−0.081***
	[0.026]	[0.038]	[0.025]
	Labor market outcomes		
Labor-force participation	0.077***	0.013	0.061***
	[0.023]	[0.016]	[0.022]
Employed	0.013***	0.007***	0.015***
	[0.002]	[0.003]	[0.002]
ln(wage income)	0.006	−0.011	0.002
	[0.022]	[0.021]	[0.023]
Hold a second job	0.006***	0.004*	0.007***
	[0.001]	[0.003]	[0.001]
Time trend	Yes	Yes	Yes

NOTES: The sample includes individuals aged 24–55. Each entry in columns 1–3 reports the difference-in-differences estimates (α_3) from a separate regression of Equation (21) with the dependent variable listed in the left column. The highly (lowly) educated sample includes both men and women who are highly (lowly) educated. Besides the female and posttreatment time dummies, age, age squared, education years, and a time trend are included in all specifications. The highly educated group refers to individuals with a college education or above. Robust standard errors adjusted for treatment × female clustering are reported in brackets. *Significant at 10%; **significant at 5%; ***significant at 1%. Data sources: Hong Kong censuses 1991, 2001, and by-censuses 1996, 2006; Taiwan censuses 1990, 2000.

results are consistent with Hypothesis 1, suggesting that the decrease in cross-border marriage costs reduces the marriage rate for women relative to men. We conclude that the increase in the OWP quota and the handover have decreased women's relative position in the marriage market. Note that the relative rise of HK men's marriage rates by 8.8 percentage points also implies more mainland women than mainland men marry HK residents. Given the education gaps in cross-border marriages, for mainland women, hypergamy thus occurs with the increase in the OWP quota and the handover.

When the whole sample is divided into two subsamples by education levels, we find women with an educational attainment lower than college level are more likely to be affected by cross-border marriages (columns 2 and 3). The magnitudes (in terms of absolute values) of the three estimates for the highly educated group are much smaller than for the less educated group. Furthermore, the estimates of the currently married and ever-married rates are statistically significant. These results are consistent with Hypothesis 2.[51] The change in marital status should be focused on the group with a low education. Our result contradicts the education boom as an alternative explanation for the increase in cross-border marriages, because it predicts the change in marital status focuses on the highly educated group.[52]

HK women's intrahousehold power decreased compared with HK men's intrahousehold power during the same period. The middle panel of Table 5 reports that, relative to HK men, the probability of being a household head decreased by 8.5 percentage points for the HK women

[51] The differences in the estimates between the highly and lowly educated groups are statistically significant.

[52] We also divide the whole sample into two subsamples by age. We find old-aged women are more likely to be affected by cross-border marriages. The results are reported in Table A1 in the online appendix.

after the discrete increases in the OWP quota and the handover, suggesting a decrease in their intrahousehold power. The estimate is statistically significant at a high level of 1%. This result is consistent with Hypothesis 3 and again contradicts the boom hypothesis, because the latter predicts an increase in women's intrahousehold power.

When we split the sample by education levels, we find that the decrease in the intrahousehold power is marginally larger for highly educated women than for the lowly educated ones. This result is different from what we observe from the marriage market outcomes above, in which the negative effect of cross-border marriages focuses on the lowly educated group. Our theory can explain this apparent puzzle. Both lowly and highly educated HK women lose intrahousehold power with the decrease in cross-border marriage costs, because they are no longer at the short side of the marriage market. However, the lowly educated women may lose less than the highly educated group for two reasons. First, women with low education may have "married down" with the increase in cross-border marriages. Hence, their education relative to the husband's rises, which can partly offset the overall decrease in their intrahousehold power. Second, the highly educated women are married to the same husbands after the increase in cross-border marriages.

Combining the results reported in both the top and middle panels, we conclude that the HK women with a high education are worse off only at the "intensive" margin because of the loss in intrahousehold power.[53] However, the HK women with a low education are affected 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 due to the loss of intrahousehold power. The previous discussion indicates that the welfare loss at the intensive margin is larger for women with a high education than for women with a low education. However, the decrease in welfare is larger for the latter group as a whole, because being involuntarily unmarried or divorced causes a large loss in an individual's welfare, as specified in our theoretical model.

In Table 5, we focus on the gender differential change in the outcomes of the HK residents by estimating Equation (21), which does not use Taipei as the comparison group. The time trend in marriage and household behavior might be different between HK men and women even without the increases in the OWP quota and the handover. A potential candidate is the East Asian financial crisis, which happened in the same year as the handover. These considerations motivate us to use Taipei as a comparison group for our analysis.

Table 6 reports the triple-difference estimates of Equation (22) (β_7) using Taipei as the comparison group. Column 1 shows that the change in gender difference in marital status is consistent with those reported in the top panel of Table 5, confirming Hypothesis 1. Relative to men, the currently married and ever-married rates for women decreased by 6.2 and 4.7 percentage points, respectively, whereas the currently divorced rate increased by 1.4 percentage points. The three estimates are statistically significant at the 1% level. Compared with Table 5, the three estimates (in terms of absolute values) are marginally smaller. When we divide the sample by education levels, the results reported in columns 2 and 3 are consistent with those reported in Table 5, confirming Hypothesis 2. Columns 4–6 replicate columns 1–3 by adding the time trend. We find the estimates experience little change after we control for the time trend.

6.2. *Labor Market Outcomes.* Although our model does not explicitly address labor supply, we examine some labor market outcomes. We report the estimates in the lower panel of Table 5. Relative to men, HK women were more likely to participate in the labor market, to be employed, and to take a second job after the discrete increase in the OWP quota and the handover. All three estimates are statistically significant at the 1% level. We also find women's monthly wage income from their first job increases relative to men, but the estimate is statistically insignificant. We conclude that the results show a negative effect on HK women's labor market opportunities,

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

TABLE 6
CROSS-BORDER MARRIAGES AND THE GENDER DIFFERENCES IN MARRIAGE BEHAVIOR OF HONG KONG RESIDENTS, USING TAIPEI
RESIDENTS AS A COMPARISON GROUP

	The Whole Sample (1)	Highly Educated (2)	Lowly Educated (3)	The Whole Sample (4)	Highly Educated (5)	Lowly Educated (6)
Currently married	−0.062***	−0.020***	−0.069***	−0.062***	−0.021***	−0.069***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Ever married	−0.047***	−0.016***	−0.052***	−0.047***	−0.016***	−0.052***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Currently divorced	0.014***	0.005***	0.018***	0.014***	0.006***	0.018***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Time trend	No	No	No	Yes	Yes	Yes

NOTES: The sample includes individuals aged 24–55. Each entry in columns 1–6 reports the triple-difference estimates (β_7) from a separate regression of Equation (22) with the dependent variable listed in the left column. The highly (lowly) educated sample includes both men and women who are highly (lowly) educated. We include region, female, posttreatment time dummies, region × female, region × posttreatment time, female × posttreatment time, age, age squared, education years in all specifications. The highly educated group refers to individuals with a college education or above. Robust standard errors adjusted for Hong Kong × treatment × gender clustering are reported in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.
Data sources: Hong Kong censuses 1991 and 2001 and by-censuses 1996 and 2006; Taiwan censuses 1990 and 2000.

as implied by our theoretic model. 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 the men.[54] This result implies that 6.8 percentage points of HK women who participated in the labor market were unemployed. Second, relative to men, HK women worked harder. Their probability of holding a second job increases by 0.6 percentage points. Although females' wage income increases by 0.6%, the estimate is imprecisely measured. These results are consistent with our theoretical model in which the decrease in cross-border marriage costs negatively affect the welfare of all HK women.

In columns 2 and 3, we divide the whole sample into lowly and highly educated subsamples. The magnitudes of the estimates are larger for the lowly educated group. Moreover, the estimate of labor-force participation is statistically insignificant for the highly educated group. These results are consistent with our theoretical prediction that HK women in the low tail in the distribution are more likely to be affected by the increase in cross-border marriages.

We conclude that the negative effects of cross-border marriages on HK women's labor market opportunities are through their deteriorated position in the marriage market. One remaining question is whether other gender-asymmetric labor market changes following the handover of HK contaminate our estimates. First, we do not find any gender-asymmetric policy changes during this period. Second, the share of output from the service sector in the GDP increases from 0.80 in 1997 to 0.89 in 2006, whereas the share of output from the industrial sector decreases from 0.14 to 0.08 during the same period. Thus, if anything, the structural economic transition would have favored females because women usually have advantages in the service sector relative to the industrial sector. The marriage-market squeeze must have dominated the effects of such structural changes.

7. DISCUSSION AND CONCLUSION

This article investigates cross-border marriages and their demographic and economic consequences. Because the distributions of marital attributes in HK and mainland China differ more for women than for men, more women from mainland China marry men in HK than the opposite match. We thus observe that when cross-border marriage costs decrease, more gender-asymmetric cross-border marriages take place. As a consequence, the relative position

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[54] The employment rate here is based on the total population.

of women in HK deteriorates both in the marriage market and within the household. The disadvantaged position of HK women in the marriage market and within marriage further exerts an incentive effect on their labor market behavior, as more HK women participate in the labor market.

Our finding that the deterioration in marriage market outcomes is more pronounced for HK women with low education shows that, in the HK context, the main force affecting cross-border marriages was the change in the OWP scheme and not the rise in female education.[55] The decrease in cross-border 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 the exit policy in the mainland side strictly regulates cross-border marriages. The increases in the OWP quotas and the handover serve as quasi-experiments that exogenously reduce the cost compared with neighboring regions such as Taiwan.

In this article, we focus on only two interacting marriage markets. But we may consider HK as a more open marriage market in the sense that HK residents can also marry partners living in more developed regions. In this case, we expect an additional repercussion effect of cross-border marriages. If the well-being of local female residents deteriorates after the increase in cross-border marriages, women will be more likely to leave HK to move to other developed regions such as Canada and the United States. Then, we may observe a chain of geographic manifestations of hypergamy. Specifically, the increase in cross-border marriages could generate emigration from HK to the United States and Canada that is biased toward females.[56]

Our model is also potentially applicable to cross-caste marriages, where social norms create "borders" between social groups. In this case, one may consider a reduction in costs as norms change.[57] Finally, the model might also be applied to rural–urban marriage migration in China, which is dominated by women (Ebenstein, 2010, 2011; Dupuy et al., 2015).

The present study raises important normative issues. As stated in our theoretical model and verified by the empirical results, the liberalization of cross-border marriages produces winners and losers. Although aggregate marital output rises upon allowing such immigration, enforcing transfers from the winners to the losers and implementing an overall Pareto-improvement is not simple. This issue seems more problematic than in the labor or good markets, where taxation can be used.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Figure A1. The number of cross-border marriages registered in Hong Kong by residence of spouse, 1986–2010
Figure A2. Proportion of marriages registered in Hong Kong by residence of spouse, 1991–2006
Figure A3. Number of new arrivals under the one-way permit scheme by the type of relatives in Hong Kong, 1991–1996
Figure A4. Male fraction of new arrivals under the one-way permit scheme with spouses and parents in Hong Kong, 1996–2006
Figure A5. Sex ratios (males/females) by age group and by year in Hong Kong (whole population), 1986–2006
Figure A6. Sex ratios (males/females) at birth by year in Hong Kong, 1981–2006

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[55] For females in the low tail of the distribution, the fiercer competition for grooms could lead to the boom in higher female education. Under this hypothesis, the boom in higher female education can be a consequence instead of the cause of the increase in cross-border marriages.

[56] Subsection A.3 in the online appendix tests the repercussion effect. The results are consistent with our predictions.

[57] See Banerjee et al. (2013) for the case of India.

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Cross-border Marriage Costs and Marriage Behavior: Theory and Evidence*

Web Appendix for Online Publication

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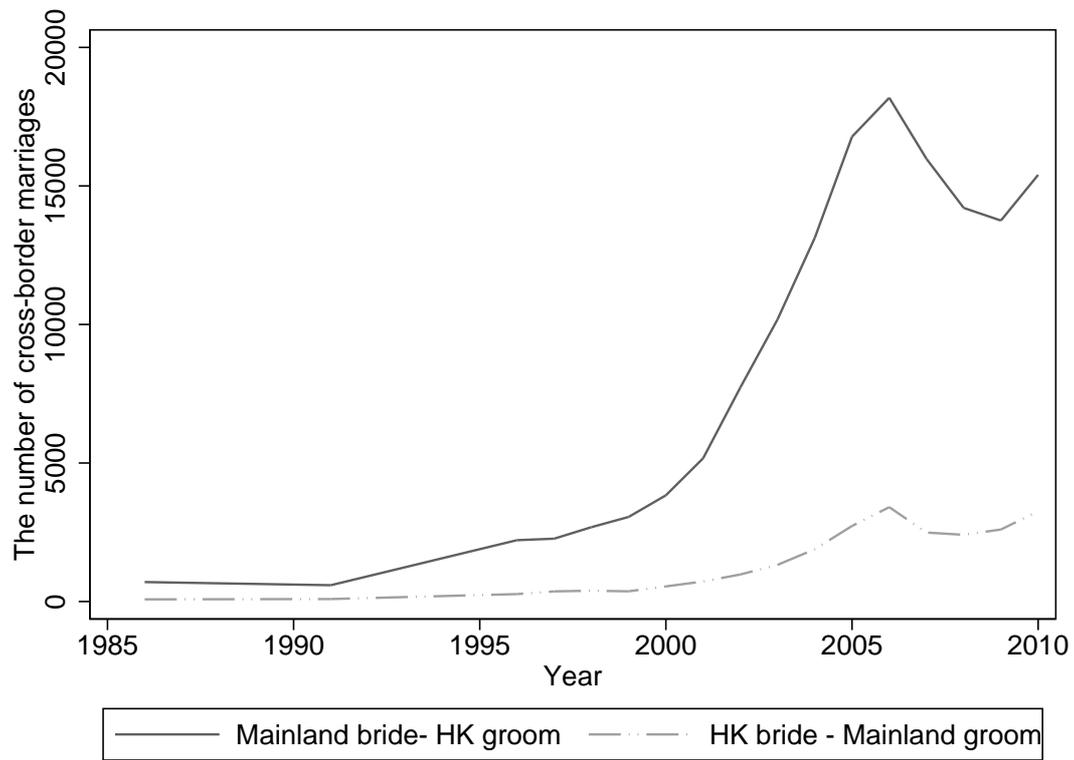January 5, 2017

A.1 Supplementary Figures and Tables

Figure A1. The number of cross-border marriages registered in Hong Kong by residence

of spouse, 1986-2010

Data source: Census and Statistics Department, 2011, *Marriage and Divorce Trends in Hong Kong, 1981 to 2010*, Hong Kong: Census and Statistics Department Press.
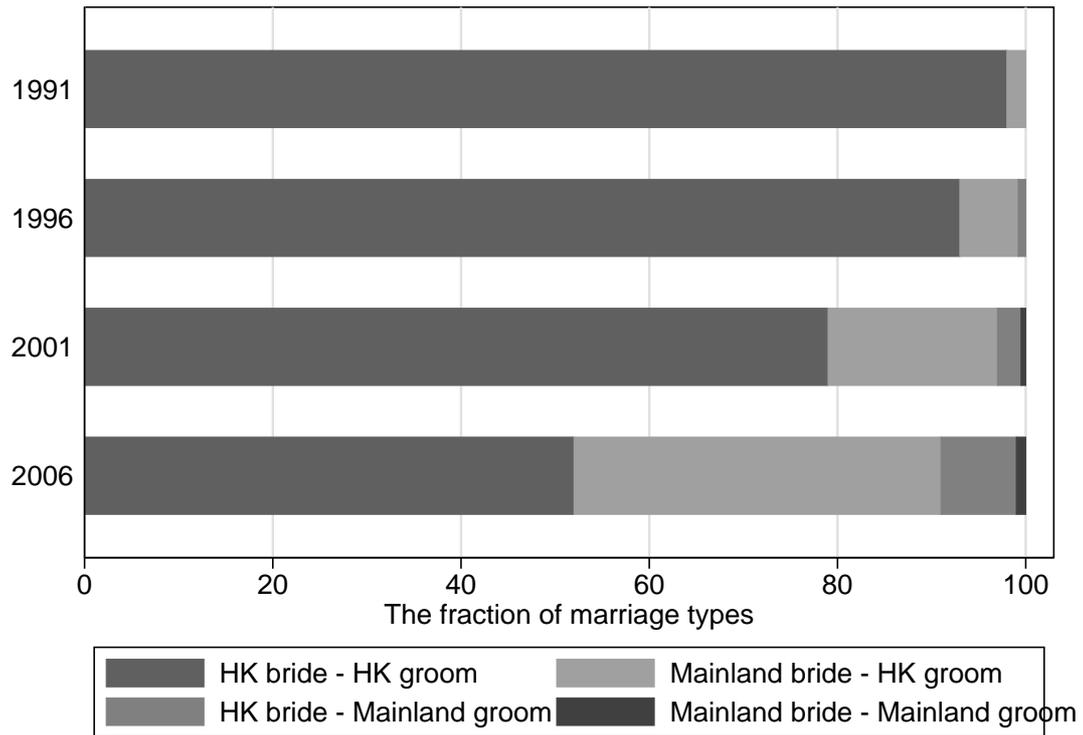
Figure A2. Proportion of marriages registered in Hong Kong by residence of spouse, 1991-2006

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.
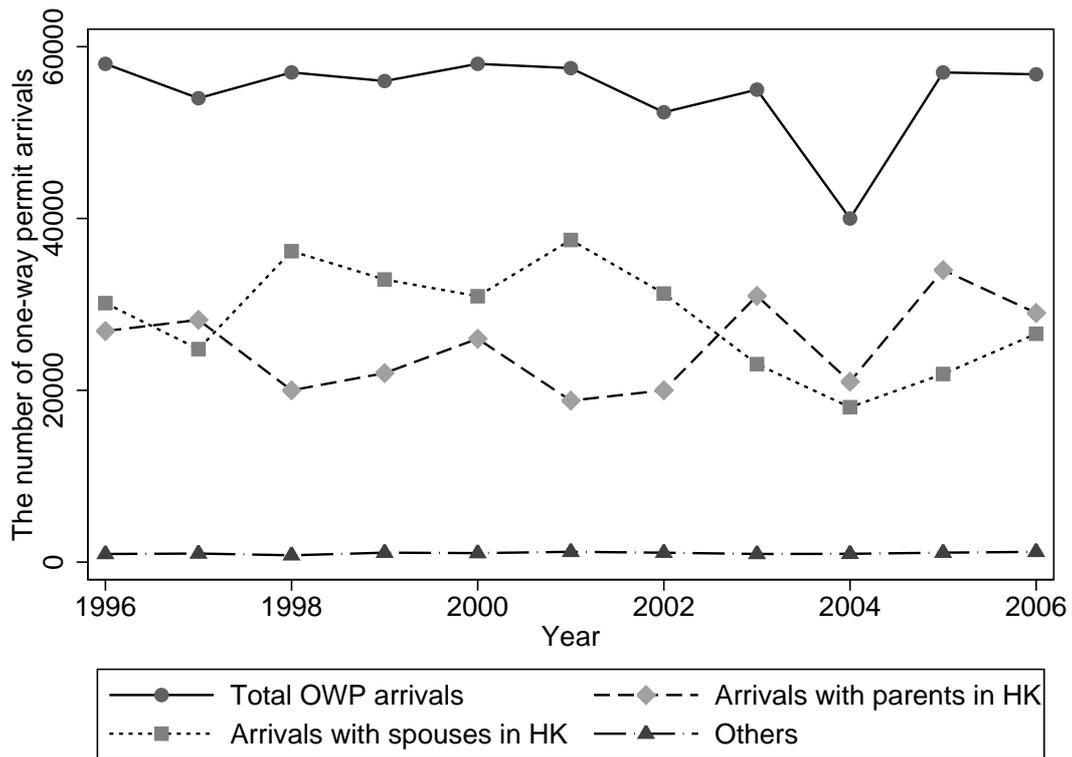
Figure A3. Number of new arrivals under the one-way permit scheme by the type of
relatives in Hong Kong, 1991-1996

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
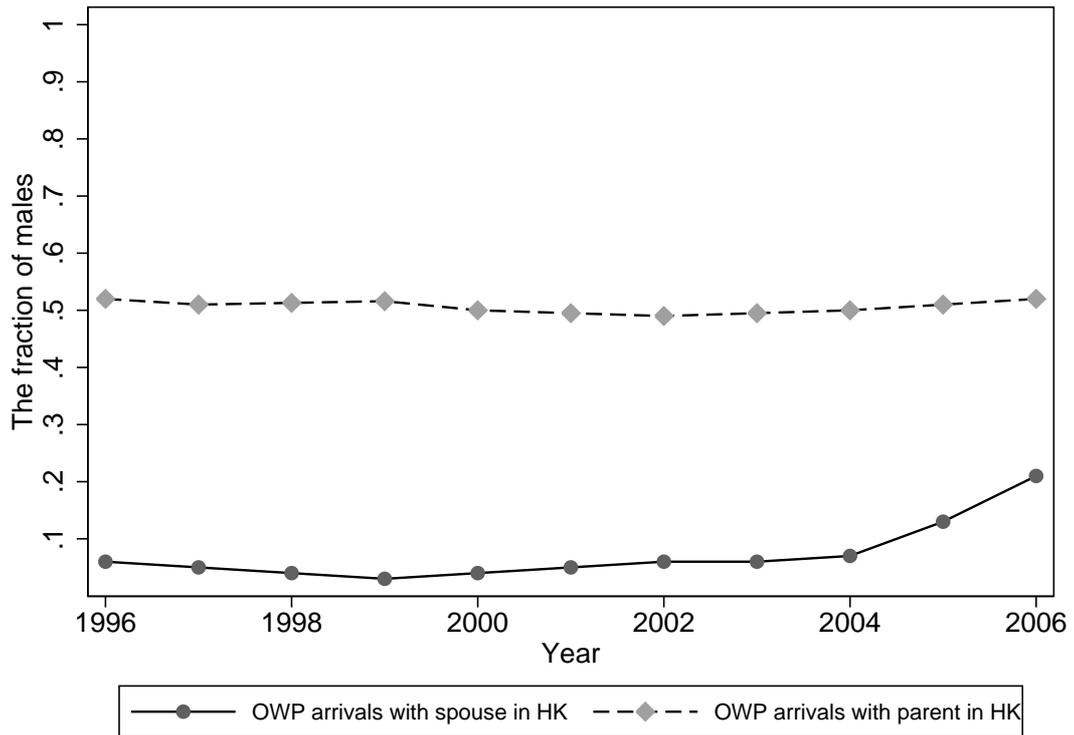Research Centre.

Figure A4. Male fraction of new arrivals under the one-way permit scheme with spouses and parents in Hong Kong, 1996-2006.

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.
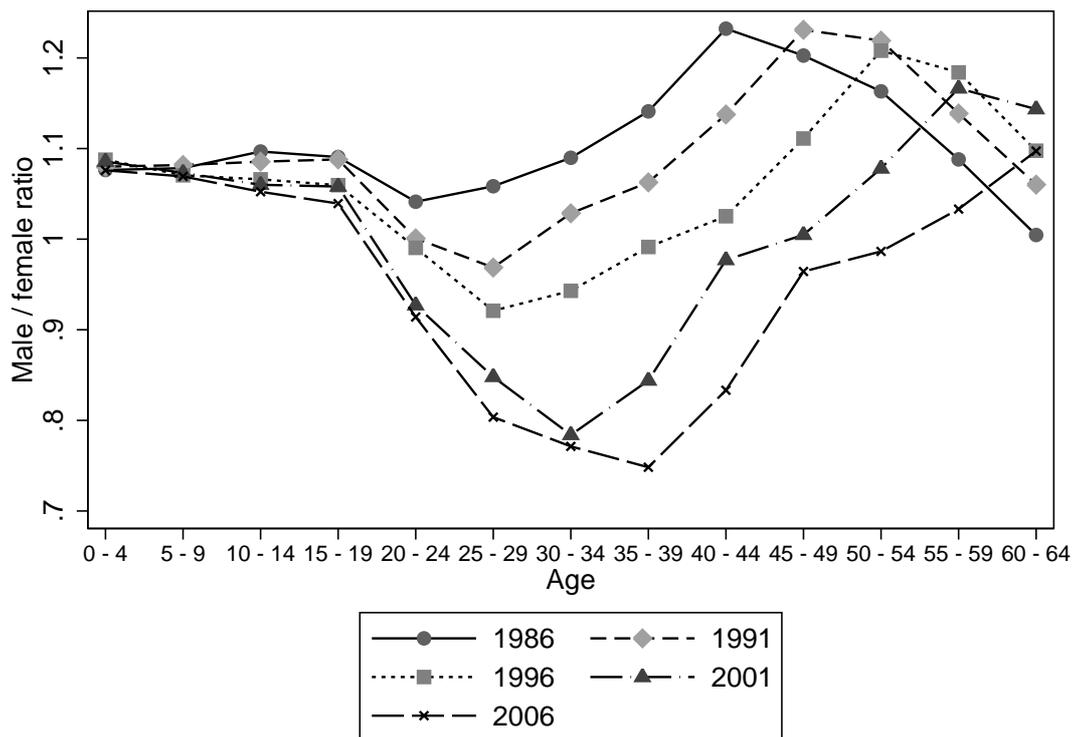
Figure A5. Sex ratios (males/females) by age group and by year in Hong Kong (whole population), 1986-2006

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

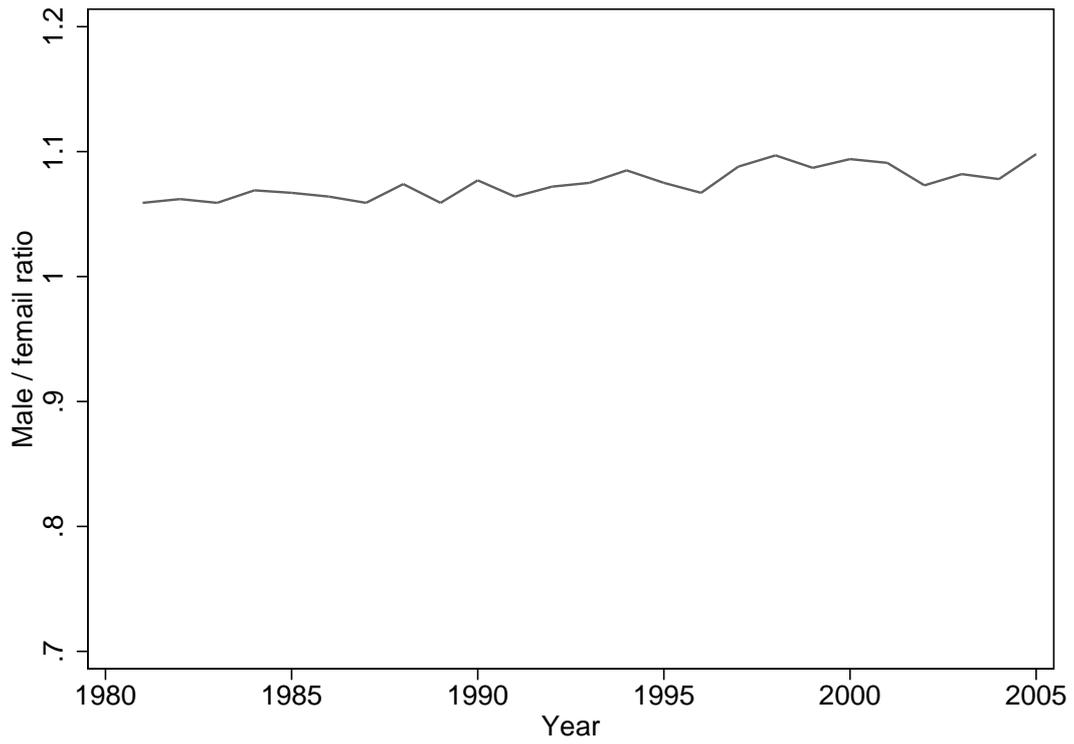Note: The average age of new arrivals with spouses in Hong Kong is 33.

Figure A6. Sex ratios (males/females) at birth by year in Hong Kong, 1981-2006
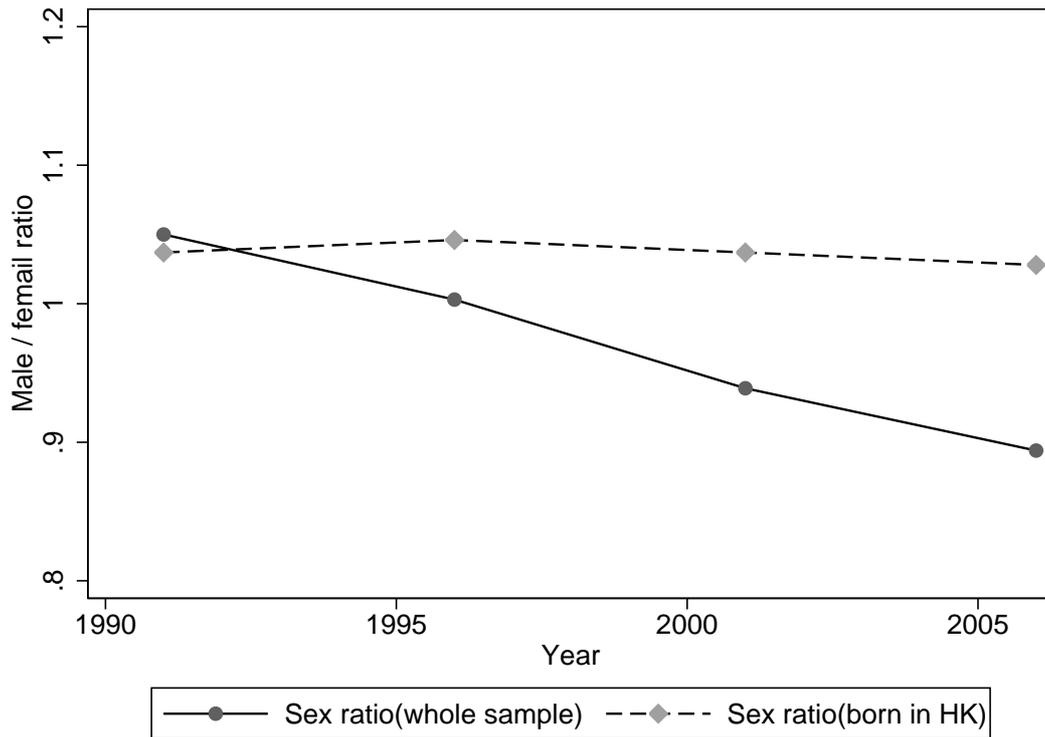
Figure A7. Sex ratios (males/females) at ages 15-65 in Hong Kong (whole population vs. born in HK), 1991-2006

Data Sources: The 1991, 2001 Hong Kong censuses (5 percent sample) and the 1996, 2006 Hong Kong by-censuses (50 percent sample)
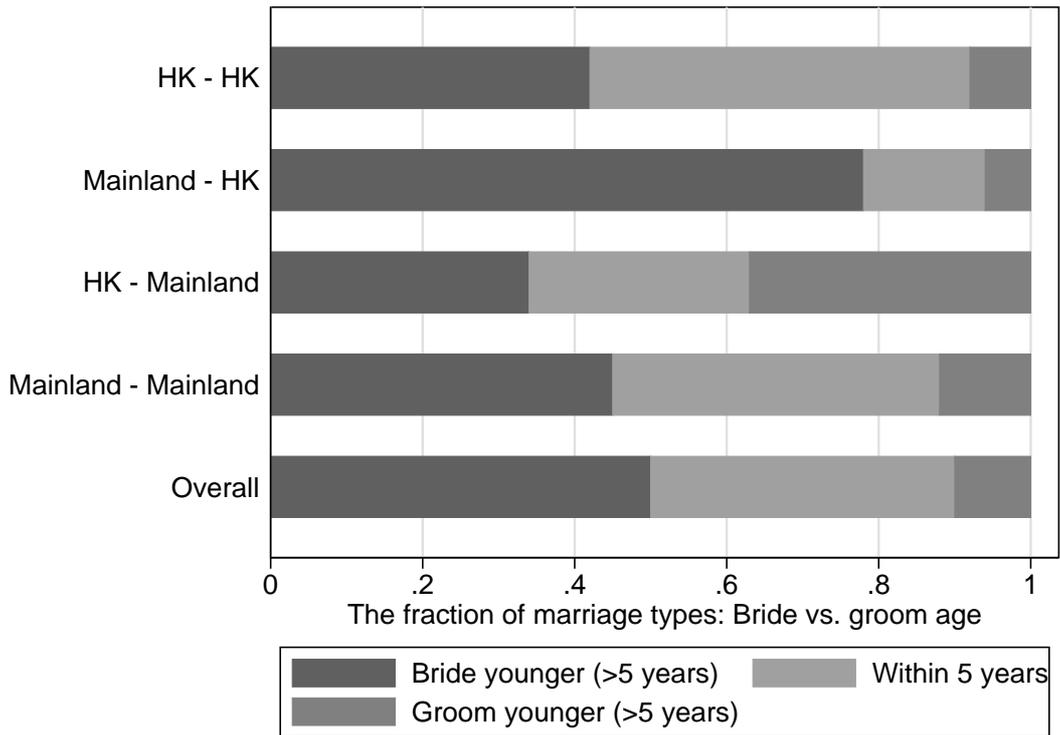
Figure A8. Proportion of marriages registered in Hong Kong by residence of spouse and difference in age, 2006

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: HK-HK: Hong Kong bride and Hong Kong groom; mainland - HK: mainland bride and Hong Kong groom; HK - mainland: Hong Kong bride and mainland groom; mainland - mainland: mainland bride and mainland groom.
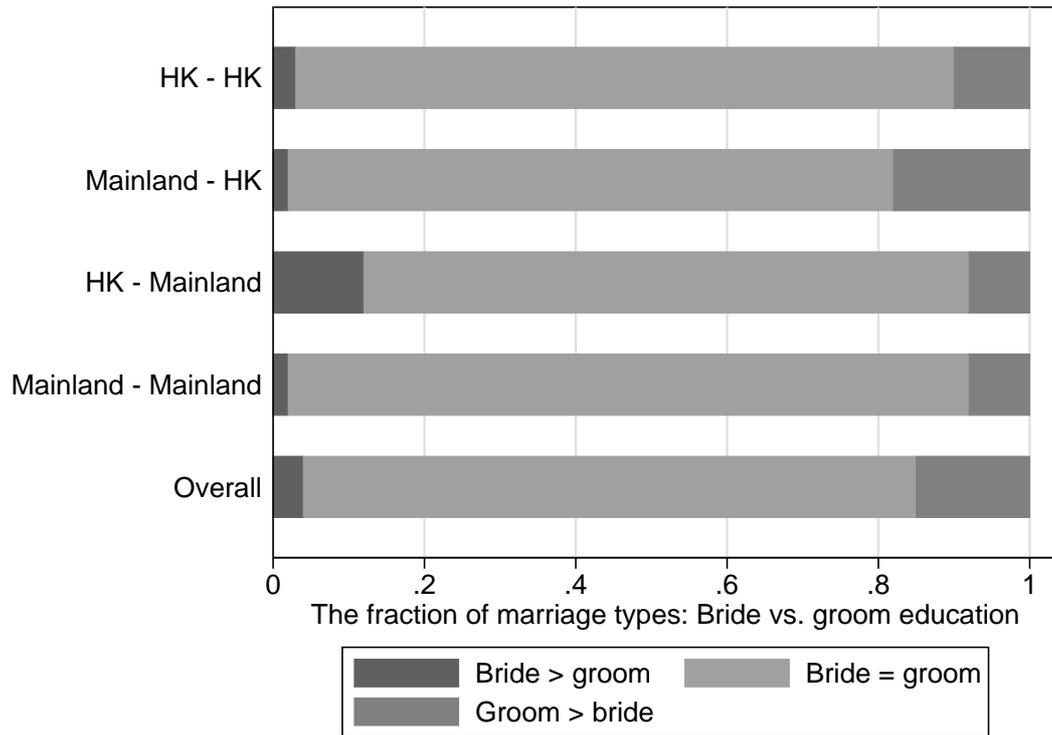
Figure A9. Proportion of marriages registered in Hong Kong by residence of spouse and difference in educational attainment, 2006

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: HK-HK: Hong Kong bride and Hong Kong groom; mainland - HK: mainland bride and Hong Kong groom; HK - mainland: Hong Kong bride and mainland groom; mainland - mainland: mainland bride and mainland groom.

Figure A10. The sum of autarky shares of Hong Kong men and mainland women $(s(m_h))$ and the marital output of cross-border marriages $(l(m_h)))$ $(w = 0.35)$

Figure A11. The sum of autarky shares of single HK men and married mainland women $(q(m_h))$ and the marital output of cross-border marriages $(l(m_h)))$ $(w = 0.35)$

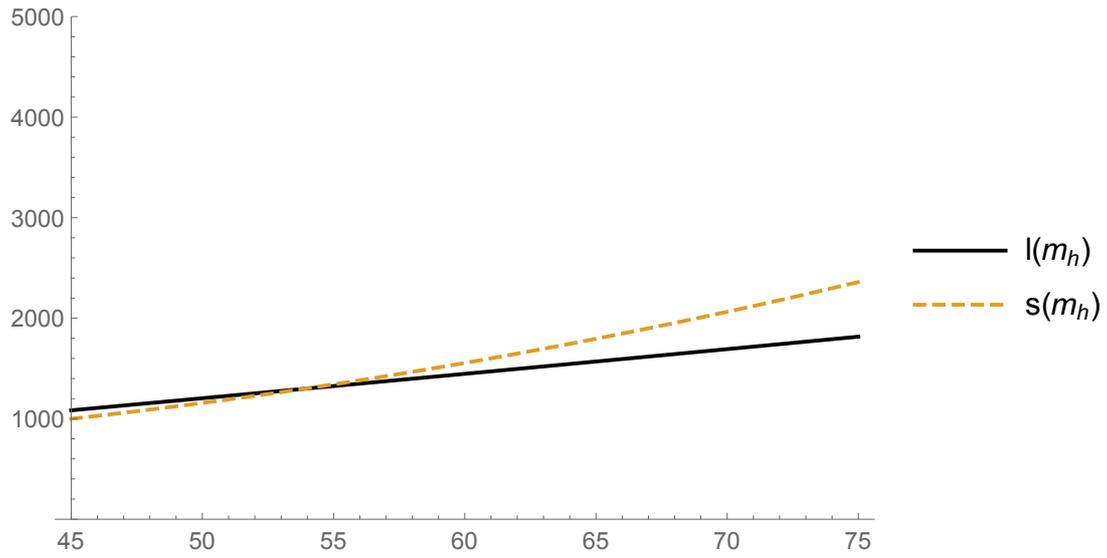Figure A12. The sum of autarky shares of Hong Kong men and mainland women $(s(m_h))$ and the marital output of cross-border marriages $(l(m_h)))$ $(w = 0.40)$

Figure A13. The sum of autarky shares of Hong Kong men and mainland women $(s(m_h))$ and the marital output of cross-border marriages $(l(m_h)))$ $(w = 0.45)$

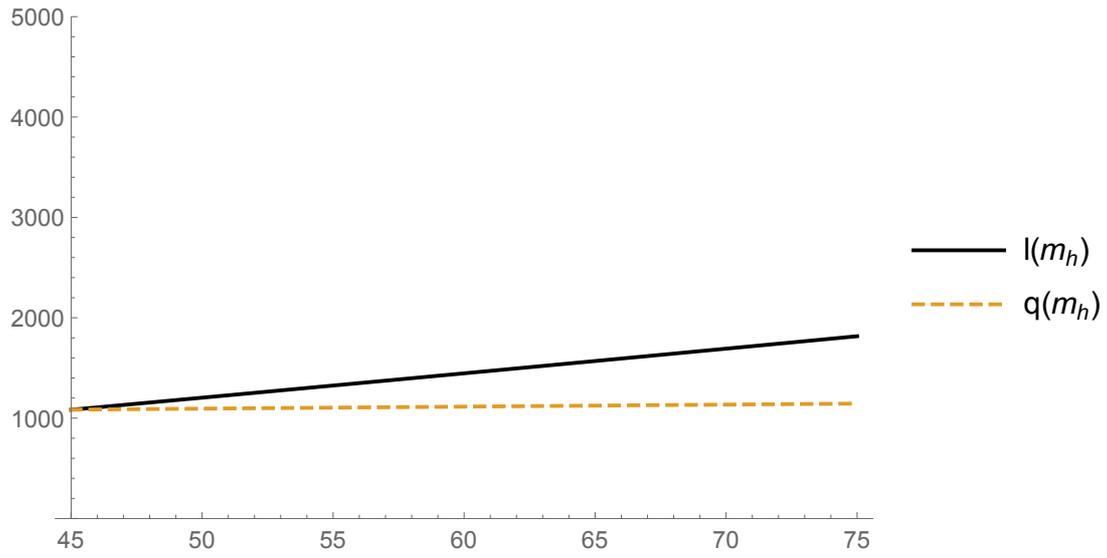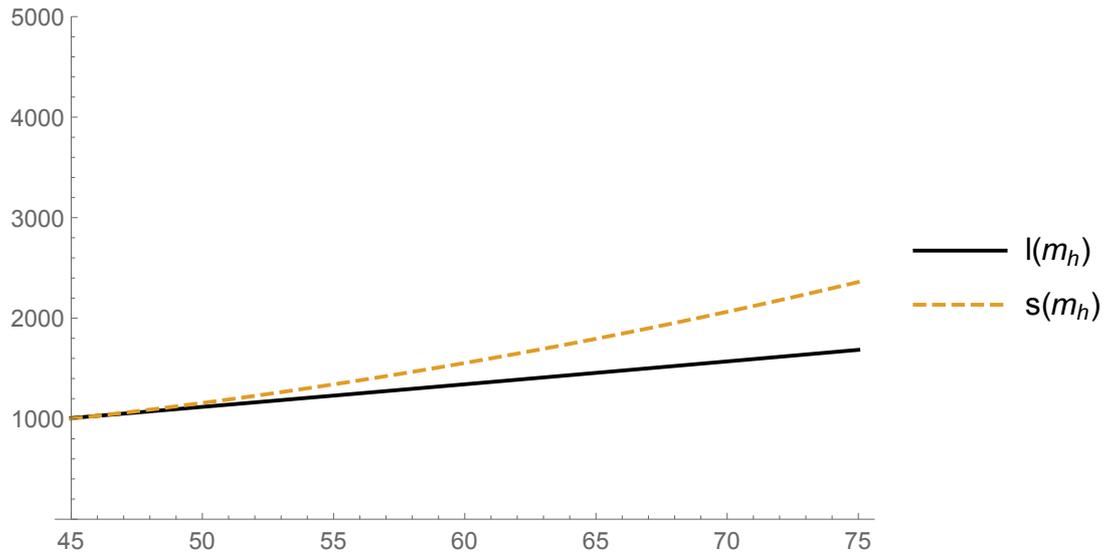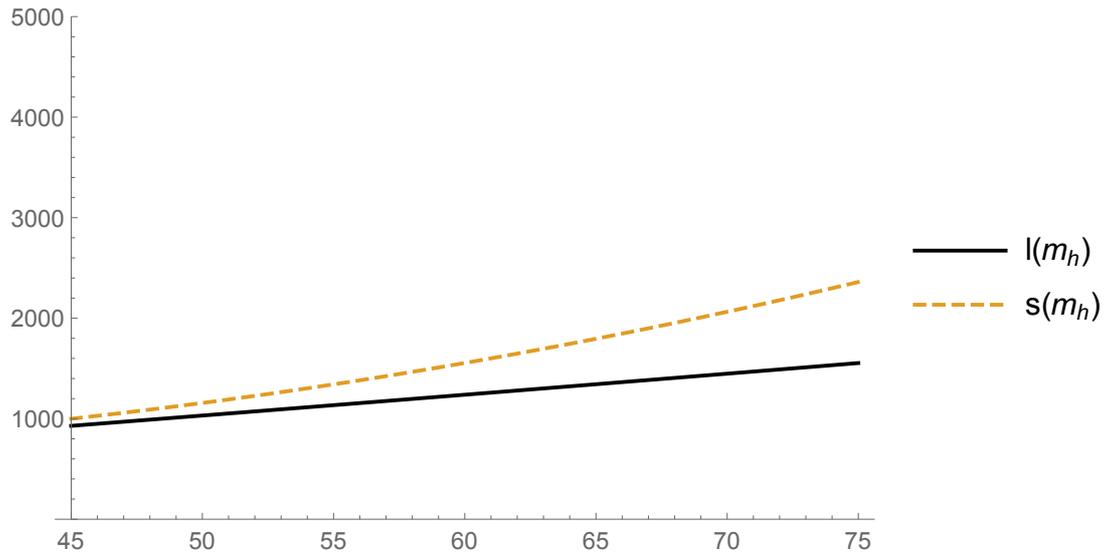Table A1. Cross-border marriages and the gender differences in family behavior of Hong Kong residents by age

	The whole sample (1)	Old age≥ 38 (2)	Young age<38 (3)
Currently married	-0.088***	-0.063***	-0.040
	[0.020]	[0.016]	[0.129]
Ever-married	-0.068***	-0.038*	-0.036
	[0.018]	[0.021]	[0.135]
Currently divorced	0.018***	0.029***	0.006
	[0.003]	[0.003]	[0.006]
Time trend	Yes	Yes	Yes

Data sources: Hong Kong censuses 1991 and 2001, and by-censuses 1996 and 2006. The sample includes individuals aged 24-55.

Note: Each entry in columns (1)-(3) report the difference-in-differences estimates (α_3) from a separate regression of Equation (21) with the dependent variable listed in the left column. Besides the female and post-treatment time dummies, education years, and a time trend are included in all specifications. Robust standard errors adjusted for treatment*female clustering are reported in parentheses. * Significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table A2. Parameters values for simulating the model

Parameters	Assumed value
Male distribution bounds in Hong Kong $[a_h, a_h + \delta]$	45, 75
Male distribution bounds in mainland China $[a_c, a_c + \delta]$	15, 45
Female distribution bounds in Hong Kong $[b_h, b_h + \delta]$	30, 60
Female distribution bounds in mainland China $[b_c, b_c + \delta]$	5, 35
Waiting time (w)	0.35
Population size parameter (σ)	50
Normalized mass of men in Hong Kong	1
Ratio of women to men in both regions (r)	0.9

Table A3. Wage distribution in Hong Kong and mainland China

	Annual wage (RMB) in 2001			
Percentile	Mainland men (urban)	Mainland women (urban)	Hong Kong men	Hong Kong women
1%	560	600	28,890	24,396
5%	1,800	1,600	64,200	41,088
10%	2,891	2,400	77,040	47,122
25%	4,320	3,744	109,140	64,200
50%	6,120	5,400	154,080	115,560
75%	9,600	7,500	256,800	192,600
90%	12,600	10,600	449,400	334,482
95%	16,300	12,600	706,200	462,240
99%	54,000	24,000	1,540,800	902,652

Data sources: mainland China: China health and nutrition survey (2001); Hong Kong: Census 2001.

Table A4. Age distribution in Hong Kong and mainland China

Percentile	Mainland men (urban)	Mainland women (urban)	Hong Kong men	Hong Kong women
1%	20	20	20	20
5%	21	21	21	21
10%	23	23	23	23
25%	29	29	28	28
50%	37	36	34	34
75%	43	42	42	42
90%	47	47	47	47
95%	49	49	48	48
99%	50	50	50	50

Data sources: mainland China: Census 2000; Hong Kong: Census 2001.

Table A5. Cross-border marriages and the emigration of Hong Kong residents to Canada and US

	Dependent variable: Gender (Female=1)		
	Panel A. All immigrants in North America		
	The whole sample (1)	Highly educated (2)	Lowly educated (3)
T (Year 1997-2000=1)	-0.025***	-0.031***	-0.025***
	[0.003]	[0.006]	[0.004]
Hong Kong immigrant	0.013	0.001	-0.002
	[0.017]	[0.027]	[0.021]
T* Hong Kong immigrant	0.068**	0.004	0.099***
	[0.030]	[0.056]	[0.036]
N	106,911	31,318	75,593
	Panel B. Immigrants from Hong Kong, Taiwan, Singapore, and South Korea in North America		
	The whole sample (4)	Highly educated (5)	Lowly educated (6)
T (Year 1997-2001=1)	-0.037*	-0.044	-0.042
	[0.020]	[0.028]	[0.027]
Hong Kong immigrant	-0.051*	-0.046	-0.096**
	[0.028]	[0.044]	[0.036]
T* Hong Kong immigrant	0.073**	0.017	0.110**
	[0.036]	[0.063]	[0.046]
N	4,055	1,885	2,170

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

Note: Each column ((1)-(6)) reports the estimates from a separate regression of Equation (20) with the dependent variable of gender (female=1). The highly (lowly) educated sample includes both men and women who are highly (lowly) educated. Robust standard errors adjusted for census year*Hong Kong clustering are reported in brackets. * Significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. Age, age squared, and a dummy of US census are included in all specifications.

A.2 Model Extension

A.2.1 A General Model

As discussed in the paper, the necessary and sufficient condition for cross-border marriage is

$$(1) \qquad w(m_h + f_c(m_h)) + (1-w)h(m_h, f_c(m_h)) \geq u(m_h) + v(f_c(m_h)).$$

The notations are defined in the paper. We consider a special case in the paper. That is, $v(f_c(m_h) = v$. We now consider a general model. Thus, $v(f_c(m_h))$ is a function of m_h.

For each man m_h in HK who considers a cross-border marriage, we evaluate the share his prospective wife would have in mainland China,

$$(2) \qquad v_c(m_h) = h(m_{c,0}, b_c) - m_{c,0} + \int_{b_c}^{f_c(m_h)} h_{f_c}(s, \psi(s)) \, ds.$$

We can then write the marital output of a cross-border marriage between HK man m_h and his matched wife $f_c(m_h)$ as

$$(3) \qquad l(m_h) = w(m_h + f_c(m_h)) + (1-w)h(m_h, f_c(m_h)),$$

and the sum of the values of the two potential partners in the autarkic case as

$$s(m_h) = u(m_h) + v_c(m_h).$$

For each married man in HK, we can check if the necessary and sufficient condition holds and when it fails.

If $m_h < m_{h,0}$ so that m_h is single, we replace $u(m_h)$ by the value of singlehood, m_h:

$$(4) \qquad q(m_h) = m_h + v_c(m_h).$$

Using these definitions, we can examine the regions in which the necessary and sufficient

condition is satisfied for a given set of parameters.

A.2.2 Simulation

Given its complexity, the model does not yield an analytically tractable solution. There-
fore, we resort to a numerical analysis.[1] Table A2 presents the chosen set of parameters
that we consider plausible given the assumptions of the model and the available data.

- **Population Size (σ).** In 1997, when HK was handed over to mainland China,
  the population size in mainland China was 1,241 million, 71 million in Guangdong
  (the province neighboring HK), and 6.6 million in HK. So, the population size of
  mainland China is about 200 times of that of HK. But the probability of a HK male
  marrying a mainland woman in a remote region is very low. Actually, the majority
  of brides in cross-border marriages are from Guangdong. Thus, we discount the
  value of 200 and set the value of σ to be 50. The simulation results are very robust
  to different values of σ as long as it is larger than 20.

- **Cross-border Marriage Costs (w).** Table 1 in the paper shows the median age
  at marriage is 38.7 for HK grooms involved in cross-border marriages. Before the
  increase in one-way permit quotas in 1996, the average waiting time was about
  8-10 years. After 1996, the average waiting time decreases to 3-5 years. The life
  expectancy in HK in 1997 was about 80 for males and 84 for females. Taking
  the face values, the share of waiting time out of total marriage time, that is, the
  proportion of time the newly married partners living separately apply for the one-
  way permit, should be about 0.22 (9/(80-39)) before 1996 and 0.10 (4/(80-39)) after
  1996 for males. However, cross-border marriages involve not only time costs but
  also monetary costs. Furthermore, the first few years after marriage may be more
  valuable. Finally, children are more likely to be born in the first few years after
  marriages. The waiting time may cause those children to not be able to live with
  both parents in their childhood. Therefore, we set the initial value of w to be 0.35.

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[1]In the simulation, the marital output function $h(m, f)$ is simplified as $m + f + mf$.

We decrease the value of w when we conduct the comparative static analysis.

- **Ratio of Women to Men in Both Region (r).** Based on HK population census 2001 and mainland China population census 2000, the ratio of women to men at the age cohort 20-60 is almost 1. However, significant gender differences exist in fecundity. We assume the reproductive window is ages 20-60 for men, and 20-55 for women. The ratio of women to men in the fecundity window then is 0.875. So, we set r to be 0.9.

- **The Distribution of Women and Men's Traits.** Due to the one-way permit scheme, the mainland spouses of HK residents in new cross-border marriages are unable to migrate to HK immediately. So, these mainland spouses are not enumerated in the census at the time of new marriages. Therefore, we are unable to directly estimate the attribute function for those involved in cross-border marriages.

We present some basic statistics about wage and age distributions in HK and mainland China below. From these distributions, we can get a sense of the distributions of the attributes between mainland China and HK. In Table A3, we tabulate the distribution of the annual wage by gender and by HK versus mainland China. The wage of HK men at the 5th percentile is higher than that of mainland men at the 99th percentile, which means HK men at the bottom earn more than mainland men at the top tail in the early 2000s. For women, the wage of those at the 1th percentile in HK is higher than the wage of those at the 99th percentile in mainland China.

Table A4 tabulates the distribution of age by gender and by HK versus mainland China. A small difference exists in the age distributions between mainland China and HK. The average age is lower by two in mainland China than HK, which means the population is younger in mainland China than in HK. As we do not specify the attribute function in the paper, we initially set $a_h = 45, a_c = 15, b_h = 30, b_c = 5$, and $\delta = 30$ for an illustration. These parameter values satisfy the conditions (Equations

(8) and (9)) in Section 4.3 in the paper.

Our simulation results below are robust to other parameter values for the attribution distributions in HK and mainland China. Our simulation results remain robust when we experiment with other values with these parameters.

Based on these chosen parameters, Figure A10 presents the sum of the marital shares of the two parties, $s(m_h)$, by the dashed line, whereas the marital output of prospective cross-border marriages, $l(m_h)$, is represented by the solid line. The indifference condition,

$$l(m_h) = s(m_h),$$

has the solution $m_2 = 53.86$. Figure A11 shows the corresponding graph for single HK men. We see these men would also marry mainland women, because the sum of the alternative opportunity costs, $q(m_h)$, is lower than the marital output $l(m_h)$ such cross-border marriages generate.

We see that top HK men strictly above m_2 are unwilling to marry women from mainland China, because they already have a good match in HK, reflecting the assumption that top HK women are better than top mainland women. All HK men strictly below m_2 would like to marry women from mainland China and form a cross-border marriage.[2] If a sufficient number of HK men actually replace their local wives, more HK women than men will want to marry local residents.[3] This tendency will raise the share of men in each local marriage and mitigate their willingness to marry women from mainland China.[4] However, we assume that when cross-border marriages are formed, agents take into account only the current situation and ignore possible future global changes in the

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[2]HK men sufficiently close to m_2 may be indifferent between the two options and randomize their choice. See Chiappori et al. (2014).

[3]In practice, replacement of a local HK woman by a mainland woman can occur either by divorce from a local HK man or by avoiding the local marriage in the first place. The latter case will be more common if costs of divorce are substantial.

[4]Note that when a HK man marries a woman from mainland China, the numbers of HK men and HK women do not change.

marriage market.

A.2.3 Comparative Static Results

Given the model, we now examine how it responds to changes in parameters. We are particularly interested in the decrease in the cost of waiting time w, because it is directly affected by the OWP scheme. The increase in OWP quotas decreases the waiting time (the value of w). Therefore, our main interest centers on identifying its impact on the marriage market and household. The reduction in cross-border marriage costs can have a large effect on the assignment patterns and gains from marriage in HK. Because the difference in the marital attributes between HK and mainland China is larger for men than for women, HK men are more likely than HK women to marry residents from mainland China.

We show that an increase in the cost of waiting w leads to fewer women from mainland China and an increase in the marriage probability of HK women. Specifically, when $w = 0.40$, $m_2 = 45.97$ (Figure A12). Figure A13 shows the indifference condition $l(m_h) = s(m_h)$ has no solution when we set the waiting-cost parameter (w) to be 0.45, which means no cross-border marriages exist.

A.3 The Repercussion Effect

This section tests the repercussion effect of cross-border marriages. We use the 2001 Canada Census Integrated Public Use Microdata Series (IPUMS) file (2.5 percent sample) and the 2000 US Census IPUMS file (5 percent sample), and focus on the immigrants in these countries. Given that approximately 80 percent of HK emigrants moved to North America, the HK immigrants in the two censuses constitute the main 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 ensure the comparability of the treatment and the comparison groups in our estimation of the repercussion effect, we further restrict the first subsample to one that includes only immigrants who came from HK, Taipei, Singapore, and South Korea,

which gives us the second subsample. Given that these four economies are known as the "Asia's Four Little Tigers" in terms of their economic performance, we consider that the immigrants from Taipei, Singapore, and South Korea constitute a sound comparison group for those from HK.

Based on the two subsamples, we focus on the estimation of the following equation:[5]

$$(5) \qquad Gender_i = \eta_0 + \eta_1 T_i + \eta_2 HK_i + \eta_3 T_i * HK_i + X_i \eta_4 + US_i + \varepsilon_i.$$

We use a dummy variable $Gender$ as the dependent variable. It equals 1 if the immigrant is a female, and 0 otherwise. With regard to the independent variable T that measures the treatment period, we consider 1991-1996 as the pre-treatment period, and 1997 onward as the post-treatment period. We further consider immigrants from HK as the treatment group ($HK = 1$), and immigrants from other places as the comparison group ($HK = 0$). X is a vector of variables that measure individual characteristics. Finally, given that we pool two census data sets, we include a dummy variable US that indicates the US census. ε is the error term.

We predict that more women than men would migrate from HK to North America in response to the policy change and handover. Therefore, η_3 is predicted to be positive, and the magnitude of η_3 should be larger (in terms of absolute value) in the lowly educated subsample. The results are reported in Table A5. Using all other immigrants in North America as a comparison group, column (1) of Panel A reports the change in the gender difference in immigrants from HK. HK women were more likely to migrate than men to North America after the increase in the OWP quotas and the handover. The estimate of η_3 is both statistically and economically significant. Relative to the immigrants from other regions, the number of females from HK has increased by 6.8 per 100 immigrants since 1997.

In column (4) of Panel B, we restrict the comparison group to immigrants from Taipei,

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[5]To facilitate interpreting our DD estimates, we adopt the linear probability model. The results remain robust when we use the probit or logit estimator.

Singapore, and South Korea to North America. The results are similar to those reported in column (1). Finally, the increase in female immigrants from HK since 1997 is concentrated on the lowly educated group. Therefore, we conclude that the results reported in Table 6 show cross-border marriages induced by the increase in the OWP quota and the handover have caused a greater number of lowly educated women to migrate to North America compared with other groups. These results are strongly consistent with our theory, and again contradict the boom hypothesis. Our results suggest a general equilibrium effect of cross-border marriages, which may lead to a global hypergamy.