From protests into pandemic: Demographic change in Hong Kong, 2019-2021

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Abstract

This paper examines changes in fertility and nuptiality during the first four waves of the COVID-19 pandemic in Hong Kong. Compared to other settings, COVID-19 infection and death rates in Hong Kong were very low until 2022. This was achieved through a combination of top-down interventions (e.g., quarantines, 'mask mandates') and community activation. However, in addition to these epidemiological circumstances, Hong Kong during this period has also undergone significant social and political change stemming from the social movement beginning in 2019 through the enacting, and aftermath, of the National Security Law. In this study, we draw on registered birth and marriage data from 2015 through 2021 to explore how fertility and nuptiality changed after the social movement followed by the first four waves of the COVID pandemic. We describe how fertility and marriage rates have changed in Hong Kong in 2019 and onwards and to what extent the changes are associated with the social movement and the COVID pandemic. We further disaggregate the fertility and nuptiality trends by Hong Kong-born and non-Hong Kong-born population, with a specific focus on migrants from mainland.

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Introduction

Many studies have explored the impact of the COVID-19 pandemic on demographic outcomes of mortality, marriage, and fertility. Compared to other settings, COVID-19 infection and death rates in the Special Administrative Region of Hong Kong in the People's Republic of China (hereafter Hong Kong) were very low until 2022. This was achieved through a combination of top-down interventions (e.g., quarantines, 'mask mandates') and community activation (Cruz et al., 2020). Hong Kong, however, presents a unique setting to explore the interaction between the major social effect of the pandemic because of its juxtaposition (and overlap) with a significant social movement and ensuing political and social uncertainty. In this study, we pose two questions: 1) How have fertility and nuptiality changed in Hong Kong since the peak of the social movement in mid-2019 followed by the COVD-19 pandemic? And 2) How did the change in fertility and nuptiality differ by birthplace, especially between Hong Kong- and Mainland-born population? Drawing on registered birth and marriage data from 2015 through 2021, we describe the monthly and yearly changes in fertility and marriage rates and investigate the extent to which the changes are associated with the social movement and the COVID pandemic.

Background and Context

Hong Kong and the COVID-19 pandemic experience

Various studies have identified an association between COVID-19 infection/fatality rates, population density (Martins-Filho, 2021; Wong & Li, 2020) and age structure, with older populations being more vulnerable (Dowd et al., 2020). Hong Kong is one of the most densely populated places on Earth; as well as having one of the oldest population age structures (HKCSD, 2021; UNPD, 2022). While these characteristics have been associated with various other challenges to public health (Chan et al., 2021; Sarkar et al., 2021) and other social systems (Basten et al., 2013; Cheng et al., 2013; Noesselt, 2020), prior to the so-called fifth wave in 2022, Hong Kong's epidemiological experience of the pandemic was hailed as largely positive. In the early stages of the pandemic, for example, Hong Kong's age profile of those with COVID-19 was disproportionately young (Cruz et al., 2020).

Wave 1 was the initial (low) entry of the pandemic to the territory; the period between February 2021 and the fifth wave in early 2022 was generally characterised by single-digit daily cases. Waves 2-4, which occurred between early 2020 and February 2021. Even here, the daily peaks of cases were rarely more than 100. This, of course, contrasts with countries of a similar population size such as Switzerland, Serbia or Paraguay which would regularly see cases in the thousands during this period. The so-called 'fifth wave' in early 2022 is clearly an outlier in the experience. During this period, more than 70,000 new daily cases were being reported. However, demographic data for this period is not currently available, so the analysis in this paper is confined to the period 2020-2021.

It is generally agreed that these (relatively) low rates of infection and mortality were brought about through a combination of top-down and community-driven activities (Li et al., 2022). Hong Kong was home to one of the strictest sets of restrictions regarding international travel in the world. For much of this period, inbound travel was restricted only to Hong Kong residents who were required to undertake a three-week quarantine in an approved hotel (Zhu & Tan, 2021). Indeed, Hong Kong was one of the last territories worldwide to continue to insist on hotel/government quarantine for inbound travellers, despite the fact transmission *within* a quarantine hotel setting was to blame for some recent outbreaks (Adam et al., 2022; Gu et al., 2022). Other top-down policy interventions include strict mask-wearing policies, as well as flight bans for certain airlines found to have brought in passengers with COVID-19 symptoms (Li et al., 2022). For many residents, this latter policy often meant undergoing a three-week 'washout' period in a third country before being able to return from a country to Hong Kong (Lew, 2022). However, civil society is also to be credited for playing its role in keeping infections low (until 2022) (Li et al., 2022; Wong, 2022). Following the experience of the SARS-epidemic in 2003, the switch to wearing masks, social distancing and enhanced hygiene measures was not entirely unfamiliar to many in the Hong Kong population (Hung, 2003). This also meant that resistance to such policies was relatively muted (although we will return to this point shortly).

Even though Hong Kong saw relatively low infection and mortality rates, this is not to say that the toll of the pandemic on Hong Kong was low during this period. Extended periods of quarantine were credited not only with negative mental health outcomes (Blaine, 2021; Liu et al., 2022), but also its effect on international travel (alongside the flight ban) was linked to

negative economic impacts, especially in the effective closure of the tourism sector. This effective shutting down of international travel also had the effect of separating business and families with international activities/relations. This impact on both economic and personal wellbeing has been cited as one of the reasons for driving up the number of citizens who have left Hong Kong in the past year (Al Jazeera, 2022). Domestically, regularly changing regulations impacted severely on day-to-day life. Curtailing access to restaurants, for example, may seem a luxury to some readers, but in the Hong Kong context this represented a major challenge given the cultural proclivity to eat out (in part related to the very small sizes of typical Hong Kong apartments). Again, in turn, such regulations had a knock-on effect in terms of further damaging the hospitality sector, resulting in further job losses and economic fragility. (Indeed, a recent study suggests that shortening opening hours of restaurants after limiting capacity had little to no impact on controlling the spread of the virus (Ho et al., 2022)). While some appreciated new work from home (WFH) arrangements, others felt this a further constraining feature on lifestyles – especially in the generally small conditions of Hong Kong housing (Loh & Lee, 2021; Vyas & Butakhieo, 2021; Wut et al., 2022). Any challenges of WFH were compounded by school closures. In the first five months of 2020, Hong Kong students attended in-person classes for only 25 out of 152 possible days. In fact, Hong Kong's school shutdown was among the longest in the world (Chan, 2022). Finally, immigration restrictions meant that employing migrant domestic workers (mainly from southeast Asia) who often take responsibility for children and older persons within the household in lieu of adequate government facilities further compounded this 'care crisis' for many families (SCMP, 2018).

The demographic impact of COVID-19 in Asia

The consensus is that, in low fertility settings, the COVID-19 pandemic has had a negative impact on period total fertility rates (Aassve, Cavalli, et al., 2021; De Rose et al., 2022; Sobotka et al., 2021; Ullah et al., 2020), fertility intentions (Emery & Koops, 2022) and marriage rates (Manning & Payne, 2021; Wagner et al., 2020).

In East Asia, such evidence is manifold (UNFPA, 2020). In Japan, marriage rates decreased sharply in 2020, as well as the number of births occurring later in 2020 and early 2021 (though no increase in divorce was recorded (Ghaznavi et al., 2022). In South Korea, Kim and Kim (2021) identified a 9.6–13.9% reduction in the provincial crude marriage rate in

March-June 2020 after the surge in COVID-19 cases. On top of this overall decline, a one-unit increase in the number of confirmed cases per 1,000 people in each province decreased the marriage rate by 3.8–6.2%. Regarding fertility, it is anticipated that the pandemic contributed to South Korea's total fertility rate (TFR) fall to a record low of 0.84 in 2021 (with Seoul as low as 0.64) (Reuters, 2021), continuing a downward trend in TFR. Such a trend can also be visible in Mainland China and Taiwan where, again, TFRs fell over the pandemic (Cocco, 2022; Taipei et al., 2022; Yang et al., 2022). Such rate declines in the region often go hand-in-hand with overall general decreases in the number of *events* (e.g., births and marriages) occurring because of the history of lower fertility and, hence, the process of demographic momentum.

The media in Hong Kong has, indeed, documented that the number of births in the territory has declined over the period of the pandemic (Sun, 2021). Elsewhere, the impact of pandemic restrictions on the *nature* of marriage celebrations has also been discussed (Magramo, 2022). As yet, however, no systematic analysis of either fertility or marriage rates or numbers during the pandemic period in Hong Kong has been performed. The first aim of the current paper is to try to fill that gap. We may formulate the following research question: How have fertility/marriage rates and total event numbers changed in Hong Kong over the pandemic period? Based on the foregoing literature review, we expect fertility and marriage rates to have declined in Hong Kong over the pandemic period.

Migration, protest, and pandemic

It is well documented that international migrants have disproportionately suffered under COVID-19 from stigma, the type of fragile work for many migrants – in health, caring, cleaning, service sector work which is often 'dirty, demeaning, and dangerous' – as well as restrictions to international travel and lockdowns and the impact on family reunion and remittances (Abel & Gietel-Basten, 2020; World Bank, 2020). Across Asia, outflows of workers have dropped dramatically between 2019 and 2020 – over 70% in The Philippines, India, and Sri Lanka, for example (Asian Development Bank Institute et al., 2022).

What about Hong Kong? The pandemic has clearly had a deleterious impact on the economic and social wellbeing of migrants in Hong Kong (as elsewhere) (Y. Sun et al., 2022) in addition to being subject to stigmatising statements in the public and political discourse (Paul,

2021). We have already mentioned the challenges which the international travel restrictions (and their knock-on effects) have brought to various aspects of migration in Hong Kong. These are well documented and include the recruitment of migrant domestic workers (Ullah & Chattoraj, 2022), the impact on student movement (Mok et al., 2021) and, of course, general migration.

It has been widely reported that there has been a large wave of emigration away from Hong Kong. While it is not easy to get reliable data, there is a very clear excess of departures from Hong Kong International Airport over inbound passengers – although it is not known whether this is to be for a short or long time. In much of the international media, this has focussed on 'expats' returning 'home' (Al Jazeera, 2022; France, 2022). However, the majority of emigrants are, themselves, Hong Kong passport holders. Some are moving within the region – to Taiwan, Singapore, Japan, Thailand, South Korea – while others are taking advantage new visa schemes in the United Kingdom, Australia, and Canada (Pitrelli, 2022).

Some studies have looked at the motivation for such emigration. Kan et al. (2021), for example, performed a survey in early 2021 of the migration intentions of British National (Overseas) status holders in Hong Kong. Among this group, almost one-third had 'considered' applying for a visa to settle in the UK. Among both potential UK movers and those considering a move more generally, perennial 'Hong Kong' issues are cited as 'push' factors – the price and size of housing, working hours, quality of education, cost of living, lack of social welfare and so on. However, compared to their view of the future social and economic environment, respondents felt most pessimistic about the *political* environment in the territory. Among those intending to leave, more than 50% of respondents expressed dissatisfaction with the credibility of the police; the ability to assemble and associate freely; political stability and corruption; quality of the courts; freedom of speech and expression; freedom of the press; and trustworthiness of the government (Kan et al., 2021).

This issue brings us to the second part of the context required to understand the pandemic experience in Hong Kong. Hong Kong has a long history of dissent and civil disobedience (Dapiran, 2017), not least recalling the dissident movements of the 1960s and the 2015 Occupy Central/Umbrella movement (Chan, 2021; Lo, 2016; Ma & Cheng, 2020). In 2018, Tony Chan Tong-kai admitted murdering his pregnant girlfriend, Amber Poon Hiu-wing

while they were both on holiday from Hong Kong to Taiwan. Because there is no extradition treaty between the two territories, the case was used as a justification for a proposed new law - The Fugitive Offenders and Mutual Legal Assistance in Criminal Matters Legislation (Amendment) Bill 2019 - which would enable the extradition of fugitives not only from Taiwan to Hong Kong, but also between Hong Kong, Macau, and Mainland China. This led to fears that the Bill could be a mechanism by which dissenting voices in Hong Kong could be extradited to Mainland China. On October 23rd, 2019, the Bill was formally withdrawn from the legislative agenda. Prior to this, however, Hong Kong saw a long summer of protests where millions of residents took to the streets. Over the course of mid-2019 the focus of the protests (or 'social movement') grew to encompass the treatment of protesters by police, as well as the renewal of ongoing themes relating to democratic representation, human rights, autonomy and so on.

Among other legislative responses, the Law of the People's Republic of China on Safeguarding National Security in the Hong Kong Special Administrative Region (shortened to 'National Security Law', or NSL) was passed on June 30th, 2020 (Young, 2021). According to Lo (2021) 'the new law aim[ed] at demonstrating its immediate deterrent effects on protestors and dissidents by empowering the Hong Kong authorities to pursue suspected offenders'. Since the passing of the Bill, the entire political opposition in the Legislative Council resigned in November 2020; major opposition news outlets have closed; and electoral reform laws have been passed to vet candidates for office to ensure that only 'patriots' can be elected. As discussed earlier in this section, this shifting political reality has been cited as a major factor in shaping emigration intentions and decisions (Kan et al., 2021) – although this is strongly contested (Dodwell, 2021).

It is often assumed that there was some linear transition between the social movement and the era of the pandemic – the protests died down in late 2019 only to be replaced by the pandemic at the turn of 2020. The foregoing discussion of the shifting political reality in Hong Kong in 2020 and 2021, however, shows that such a binary view of the two systems is highly misleading. When considering migration, at least, it is clearly recognised that the social movement – and the ongoing response to it – and the conditions of the pandemic are intrinsically linked. For example, as Professor Vera Yuen of the University of Hong Kong states: 'regarding this wave of exodus, there are two main reasons, the first related to the

political developments in Hong Kong, and the second related to the tightening of travel restrictions and social distancing measures in response to COVID-19…The first is likely to be a permanent change, and the second is likely to be temporary." The social movement – and the ongoing response to it – is therefore a critical contextual component to any understanding of the impact of the pandemic on demographic change in Hong Kong. The literature on the negative impact of social unrest, uncertainty (either economic or political (Gatta et al., 2021; Vignoli et al., 2020), happiness (Margolis & Myrskylä, 2011) and the lack of trust (Aassve et al., 2016; Aassve, Le Moglie, et al., 2021) on fertility rates is clear – albeit with a strong focus on the European context.

Against this more recent backdrop, we must also recognise that fertility and marriage rates were already low – and falling – before 2019. Indeed, Hong Kong had one of the lowest fertility rates in the world – 1.07 in 2018 – before the onset of the social movement and the pandemic (Basten, 2015). In common with other locations in the region, low fertility (and low marriage rates) in Hong Kong has been considered a demographic concern, especially as linked to population ageing and stagnation (Gietel-Basten, 2019) – although the Hong Kong government has, historically, been less proactive in designing policy in this area compared to other territories in the region, such as South Korea, Singapore, and Japan. In this context, we may therefore refine our research question: How have fertility and marriage rates changed in Hong Kong since the peak of the social movement in mid-2019? We expect that, because of the ongoing impact of the shifting political reality and the pandemic, fertility/marriage rates declined more steeply in Hong Kong since mid-2019 compared to previous years.

Finally, we must observe that not all groups will have experienced the pandemic (and the ongoing changes in political reality) in the same manner. Divergent fertility behaviour at the individual level under COVID-19 has been relatively little studied, and some pathways could be unclear (Aassve et al., 2020). Historically, those on lower incomes have been hit hardest by economic uncertainty which, in turn, translates into the sharpest fertility declines. Indeed, some evidence from Spain, Czechia and Austria does reveal a faster decline in fertility among those with lower socioeconomic status (Zeman & Sobotka, 2021). A recent study from the USA, for example, found that those in *higher* socioeconomic statuses saw the sharpest fertility decline under COVID (Silverman et al., 2022).

In the Hong Kong context, we can add another important dimension: migration and identity. In 2016, around 60% of the Hong Kong population was born in Hong Kong, while 31% of the was born in Mainland China, Macao, or Taiwan (HKCSD, 2017). The vast majority of the remaining 8.4% of the population are migrant domestic workers, mainly from the Philippines and Indonesia, who rarely give birth or marry in Hong Kong. We may surmise that the population hailing from the mainland may have experienced the political changes in a different manner from those born in Hong Kong – especially the younger, local population who were most active in the social movement. This then leads us to our second research question: How did the change in demographic behaviour since mid-2019 differ by birthplace, especially between Hong Kong- and Mainland-born population? We may, for example, expect that 'local' families – especially younger ones – feel more affected by these changes by heightened engagement in the social movement, and therefore have lower marriage and fertility rates relative to those born in the mainland. On the other hand, we may observe that some prevailing anti-Mainland sentiment held among some parts of the population may have increased anxiety and uncertainty for the mainland-born population which could, in turn, lead to relatively lower fertility and marriage rates. Of course, such a simplistic view also ignores confounding variables such as socioeconomic status, education and so on. Taken together, how exactly the fertility and marriage rates differ by place of birth is an empirical question.

Data and Methods

We draw on two microdata sets compiled and disseminated by the Census and Statistics Department of Hong Kong: the known births microdata covers all known births that occurred between 2015 and 2021 and the registered marriage microdata records all marriages registered between 2015 and 2021.

We start by describing the monthly trends in total fertility rates (TFRs). To calculate the monthly TFRs, monthly population exposures are estimated from mid-year female population using linear interpolation (Jdanov et al., 2022, p. 8). Given the time needed from conception to birth, the peak of the social movement in June 2019 would first affect births in February 2020. Similarly, the onset of the COVID-19 pandemic in January 2020 would first affect births in September 2020. Therefore, our analyses focus on the changes in monthly TFRs around February 2020 (i.e., 8 months after the peak of the social movement) and September 2020 (i.e., 8 months into the COVID-19 pandemic).

Next, we describe the monthly trends in number of marriages and yearly trends in marriage rates. Marriage rates are calculated by dividing number of marriages by the number of unmarried men or women aged 16 and above. First marriage rates are calculated by dividing number of first marriages by the number of never married men or women aged 16 and above, whereas re-marriage rates are calculated by dividing number of non-first marriages by the total number of divorced/separated and widowed men or women aged 16 and above.

To further assess and quantify the impact of the 2019 protest on the level and trends of total fertility rates and number of marriages, we conduct an interrupted time-series analysis (ITSA) based on OLS regression models (Linden, 2015). The ITSA model quantifies any changes in the level and rates of changes before and after the peak of the protest, and before and after the first COVID-19 case was imported to Hong Kong. The model includes one lag of the dependent variable to adjust for autocorrelation and month dummies to adjust for seasonality.

Results

Trends in births and total fertility rates

Figure 1 plots the total fertility rates from January 2015 to December 2021. While TFR at had been on the decline long before 2020, there is a steep drop immediately after February 2020, which is around 8 months after the peak of the social movement, and the steep decline continued into 2021.

[FIGURE 1 ABOUT HERE]

The steep decline after February 2020 is also illustrated in Figure 2, which plots the year-over-year growth rate in monthly TFR, that is, the rate of change in TFR of a given month compared to the same month the previous year. While monthly TFRs in 2019 fluctuate around the same level of the previous year, TFRs in 2020 present a sharp decline relative to the same months in 2019. The year-over-year decline in monthly TFR continued until the late 2021, when it stabilises at around the same level as the late 2020.

[FIGURE 2 ABOUT HERE]

To quantify the changes in the level and trends of total fertility rates around February 2020 (i.e., 8 months after the peak of the social movement) and September 2020 (i.e., 8 months after the onset of the COVID-19 pandemic), we conducted an interrupted time-series analysis (ITSA) of the monthly TFR. According to the regression coefficients (Table 1), prior to February 2020, TFR had been declining at a monthly rate of 0.003. February 2020 is associated with a 0.038 decrease in the *level* of TFR as well as a 0.013 decrease in the *rate* of change, both statistically significant. After September 2020, the *level* of TFR remained low but the *rate* of decline has rebounded by 0.015 back to the rate before February 2020.

[TABLE 1 ABOUT HERE]

To answer our second research question, we disaggregate the trends in births and TFRs by whether the woman is Hong Kong-born or not. Figure 3a illustrates a clear divergence between the two subpopulations in the share of births: while the share of births by mothers from mainland has decreased and the share of births by Hongkong-born mothers and non-Hongkong-born mothers from elsewhere has increased, and such divergent trends began since February 2020 (i.e., 8 months after the peak of the social movement), well before September 2020, which is the earliest the COVID pandemic could have affected births. Figure 3b further disaggregates births to mothers from mainland by their lengths of stay in Hong Kong. The figure shows that the decrease in share of births to mainland mothers is not limited to temporary migrants who have lived in Hong Kong for less than a year.

[FIGURE 3a and 3b ABOUT HERE]

In addition to the share of births, we further disaggregate TFR by birthplace. Using the population estimates between the censuses in 2016 and 2021, we interpolate the yearly population exposure and estimate the TFR by whether the woman is Hong Kong-born or not. Figure 4 reveals that, while there had been steady declines in TFRs for all groups of women, the sharpest drop in TFR, from 2019 through 2021, is observed among women from mainland, consistent with the monthly trends in share of births presented above.

[FIGURE 4 ABOUT HERE]

Trends in marriages and marriage rates

Using microdata of registered marriages, Figure 5 illustrate the year-over-year number of all registered marriages from 2018 to 2021. The monthly trend of the first half of 2019 traces closely that of the previous year, however, right after June 2019 (i.e., the peak of the social movement), the number of marriages started dropping below the level of the previous year and the decline continued throughout 2020, until in 2021, the number stabilises around the 2020 level. Figure 6 further disaggregates the monthly trends by first marriages (for both the bride and groom) or not. The most pronounced decline is observed among non-first marriages, and the decline started before the COVID pandemic hit in January 2020.

[FIGURE 5 ABOUT HERE]
[FIGURE 6 ABOUT HERE]

To quantify the changes in the level and trends of number of marriages around June 2019 and January 2020, we conducted an interrupted time-series analysis (ITSA). As shown in Table 2, June 2019 (i.e., the peak of the protest) is associated with a significant decrease in the *rate* of change in number of marriages by 216 marriages per month. After January 2020 (i.e., the onset of the COVID-19 pandemic), the rate of change has rebounded to the level before June 2019. There are no significant changes in the absolute level of number of marriages associated with June 2019 or January 2020.

[TABLE 2 ABOUT HERE]

Figure 7 plots the yearly trends in marriage rates, which are number of marriages per unmarried men or women aged 16 and above. For both men and women, while marriage rates had been on steady decline before 2019, there was a steeper drop from 2019 to 2020. The sharpest drop is among male non-first marriage rates, which changed from 0.067 to 0.025 between 2019 and 2020, a 62% decline within a year. First marriage rates are similar for males and females: a decline from around 0.03 to 0.02 (33%) between 2019 and 2020. There is little change in marriage rates between 2020 and 2021.

[FIGURE 7 ABOUT HERE]

Figure 8a and 8b illustrates the monthly trends in number of marriages, disaggregated by whether both partners of a couple are HK-born. Before 2020, the number of marriages where one or both partners are not born in Hong Kong had always exceeded the number of marriages where both partners are born in Hong Kong. From the late 2019, there is a striking decline in the number of marriages where one or both partners are not Hong Kong-born, and from mid-2020 onwards, the number of marriages where one or both partners are not Hong Kong-born is about the same as those where both partners are Hong Kong-born.

Figure 8b further disaggregates marriages where one or both partners are not born in Hong Kong by their prior residence. The striking decline in the number of marriages since the late 2019 seems equally driven by mainland-mainland couples, Hong Kong-mainland couples, as well as couples where one or both partners are from other places or origin.

[FIGURE 8a and 8b ABOUT HERE]

Discussion and conclusions

Let us now return to our original research questions. First, we asked: How have fertility and marriage rates changed in Hong Kong from the peak of the social movement in 2019? Our analysis reveals that the peak of the protests is associated with a significant drop in both the *level* and *rate* of change in TFR. After the COVID-19 pandemic hit, the level of TFR remained low but the rate of decline rebounded. Similarly, we found a steeper drop in both number of marriages and marriage rates from 2019 to 2020 compared to previously years. The most pronounced drop is observed among male non-first marriages. The experience from Hong Kong, then, accords with many other settings in the 'low fertility world' where a decline in TFR has been observed during the COVID-19 period. The 'special case' of Hong Kong, however, is that the decline began months before the onset of the COVID-19 pandemic. Again, though, we can assert that such a change is not surprising and, indeed, links to the international extant literature on uncertainty and fertility outcomes.

Our second question is: How did change in demographic behaviours since mid-2019 differ by birthplace, especially between Hong Kong and Mainland-born population? Our findings showed that the steep decline in TFR associated with the peak of the protests was driven predominantly by mothers from mainland. On the other hand, the steep drop in the number of

marriages, which preceded the beginning of the pandemic, is also driven by couples where one or both partners are non-Hong Kong born. In this sense, there is an appreciable difference by birthplace in the changes in demographic behaviours.

What explains the differential changes in TFR between Hong Kong- and Mainland-born population? One potential explanation is Hong Kong's tightening border controls directly restricting travellers from Mainland (Zhu et al. 2022). However, it is clear from our analyses that the steep decline in share of births to mainland mothers started well before September 2020, which is the earliest time the COVID-19 pandemic or any consequent border control measures (Zhu et al. 2022) could have affected births. Instead, we speculated that the social movement peaking in mid-2019 may have increased anxiety and uncertainty for the mainland-born population, resulting in steeper declines in fertility and marriage rates among them than their Hong Kong-born counterparts. With the information currently to hand, it is not possible to completely explain these differentials beyond the level of speculation. As discussed earlier in the paper, the social tensions which arouse in the community during, and after, the period of protest in 2019 impacted upon different population groups in different ways.

The next step in identifying a causal explanation for these results lies in two possible directions. Firstly, survey data – ideally longitudinal – would be able to better identify different patterns of behaviour among different groups, and link them to other social, ideational, and behavioural factors. The *Generations and Gender Survey* is one such longitudinal survey, which has been run in many other parts of the world (Vikat et al., 2007). The survey gives a holistic view of the processes of, and plans for, family formation at the individual level. In 2021, a pilot version of the survey was performed for Hong Kong and, in late 2022, the first wave will be carried out (Generations and Gender Programme, 2022). The results from this survey will not only be able to present a more causal view of the relationships between the events of the past years and demographic outcomes for Hong Kong but, due to its comparative nature, will also shed light on the international theoretical and empirical literature regarding fertility and factors such as uncertainty, happiness, social unrest and, of course, COVID-19. Without wishing to state the obvious, qualitative research will be able to better uncover the underlying thoughts, emotions and feelings which lead to the outcomes we are seeing. This is a clear and logical next step for ay study aiming to

understand the nature of demographic change in Hong Kong in recent years, especially in terms of these differential pathways.

The preceding paragraph makes clear that the data we have limits in our ability to identify causal, explanatory pathways to demographic outcomes. However, we must also recognise limitations in the data which we analyse even to provide our results here. While we are fortunate to have a near-complete microdata of births and marriages, we have needed to model the population-at-risk because of the lack of a population register in Hong Kong. This could result in discrepancies between our calculations and reality. An associated data issue is that we have only considered up to the end of 2021 because of the availability of data. While our results in general indicates little change in fertility or marriages between 2020 and 2021, as Figure 2 shows, the biggest COVID-19 outbreak in Hong Kong was, in fact, seen in early 2022. We will not know the impact that this outbreak had on demographic change until the data are released in late 2023. Similarly, as social, economic, and political issues in Hong Kong appear very much in flux at the moment, it is inevitable that, covering the timeframe we do, the 'story is only half written'.

A second challenge is that we have not been able to properly link our findings into the issue of emigration/immigration. As we discussed earlier in the paper, unlike some other territories in the region, migration is a major factor in shaping the population size and structure of Hong Kong. In recent years, as we observed, there have been many reports of a high degree of emigration from Hong Kong, motivated by various reasons including pandemic restrictions and concerns about the economic, social, and political direction of the territory (Kan et al. 2021). This presents two issues. Firstly, finding accurate statistics regarding *long-term* emigration from Hong Kong is very difficult. Most reports are based upon entry-exit data from the border, which may not reveal the true nature of migration plans and processes. Secondly, how do we measure and account for the demographic behaviour of those who have left Hong Kong? If people have left and they bear children abroad, then this will not affect TFR rates (as both the child and the contribution of the parents to the at-risk population is missing). However, such children are citizens of Hong Kong and may come back at some point in the future (with or without their parents). As such, without a proper analysis of the migration, and the demographic behaviour of migrants, our account of these demographic changes is only ever going to be a partial one.

Without a better understanding of the dynamics which are shaping these outcomes – especially by population group – it is not so straightforward to set out the implications, let alone the policy implications. However, one means of doing this is to take a step back from the events of the most recent years to look at the 'demographic big picture'. Before the era of the protests and the ongoing pandemic, Hong Kong's TFR and marriage rates were already very low. The events of the past years have only served to push these figures even lower. Considering, therefore, why these rates were so low in the first place is important not only in its own right, but also as a means of understanding the factors which shaped a further decline in the recent past. Very recently, there has been more and more discussion in policy circles stating concerns about the low fertility rates. In September 2022, for example, Regina Ip Lau Suk-yee, convenor of the Executive Council suggested that the Hong Kong government offer a USD2,500 'baby bonus' to new parents, as well as a USD6300 grant to prospective parents to offset costs associated with freezing eggs and sperm (Lam, 2022). On the other hand, it is also important to better frame the discussion of why such low fertility and marriage rates are a 'problem' for Hong Kong. In the territory, as elsewhere, this is often linked to a concern over population ageing. However, such challenges relating to this demographic structural change may well be better resolved through institutional reform rather than by simply increasing fertility. Either way, without a better, holistic understanding of the causes and consequences of low fertility in Hong Kong, it will be hard to design adequate policies to support families in their stated reproductive goals and the maintain long-term sustainable development of the population. Given that migration formed such an important part of Hong Kong's previous 'demographic resilience' to ultra-low fertility, it is inevitable that an imbalance between emigration and immigration in the present and future could quickly, and significantly shape the population size structure of Hong Kong. Under these circumstances, maximising the potential of all Hong Kong residents, no matter where they hail from, will be a critical part of any policy of sustainable population development.

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Tables and Figures

Table 1. TFR: Estimates from Interrupted time-series analysis (ITSA) with one lag. February 2020 marks 8 months after the peak of the social movement in June 2019, and September 2020 marks 8 months after the COVID-19 pandemic started in January 2020.

Total fertility rates	Coefficient	
Pre-February 2020 trend	-0.0026***	(0.0003)
Post-February 2020 intercept change	-0.0382*	(0.0161)
Post-February 2020trend changes	-0.0131***	(0.0035)
Post-September 2020 intercept change	-0.0320	(0.0220)
Post-September 2020 trend change	0.0147***	(0.0039)

Note: Newey-West standard errors are in parenthesis. Model adjusts for monthly dummies.
*p < .05; **p < .01; ***p < .001

Table 2. Number of marriages: Estimates from Interrupted time-series analysis (ITSA) with one lag. June 2019 marks the peak of the social movement, and January 2020 marks the beginning of the COVID-19 pandemic in Hong Kong.

Number of marriages	Coefficient	
Pre-June 2019 trend	-5.764*	(2.411)
Post-June 2019 intercept change	67.306	(126.99)
Post-June 2019 trend change	-215.765***	(57.90)
Post-January 2020 intercept change	-168.631	(324.98)
Post-January 2020 trend change	206.381**	(58.39)

Note: Newey-West standard errors are in parenthesis. Model adjusts for monthly dummies.
*p < .05; **p < .01; ***p < .001

Figure 1 Monthly total fertility rate, January 2015-December 2021. February 2020 marks 8 months after the peak of the social movement in June 2019, and September 2020 marks 8 months after the COVID-19 pandemic started in January 2020.

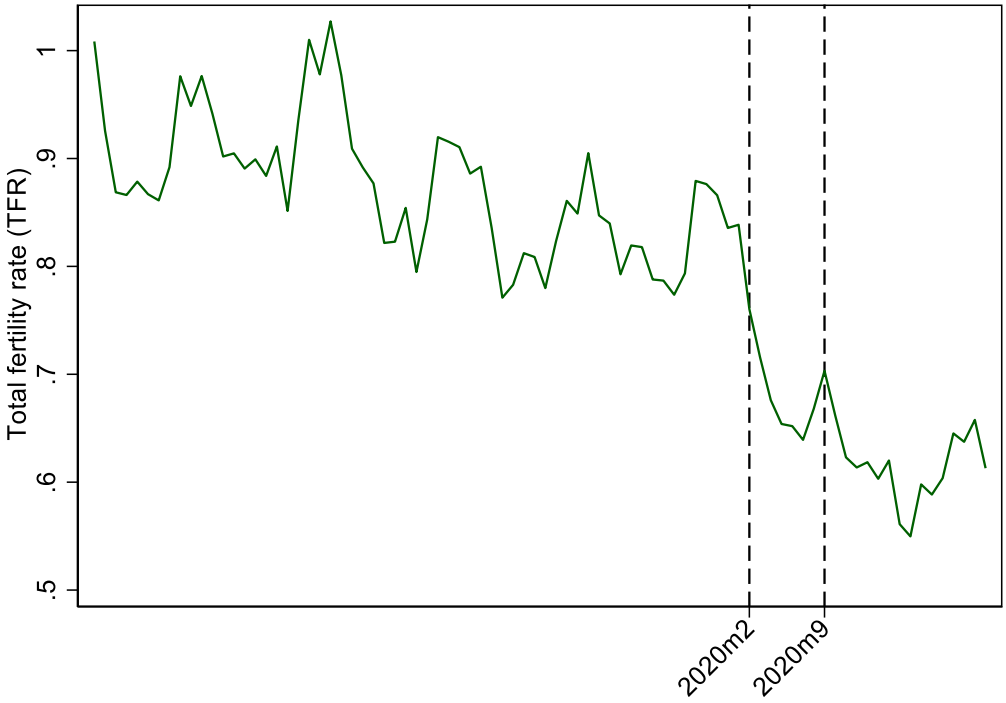

Figure 2 Year-over-year growth rate in TFR, 2019- 2021

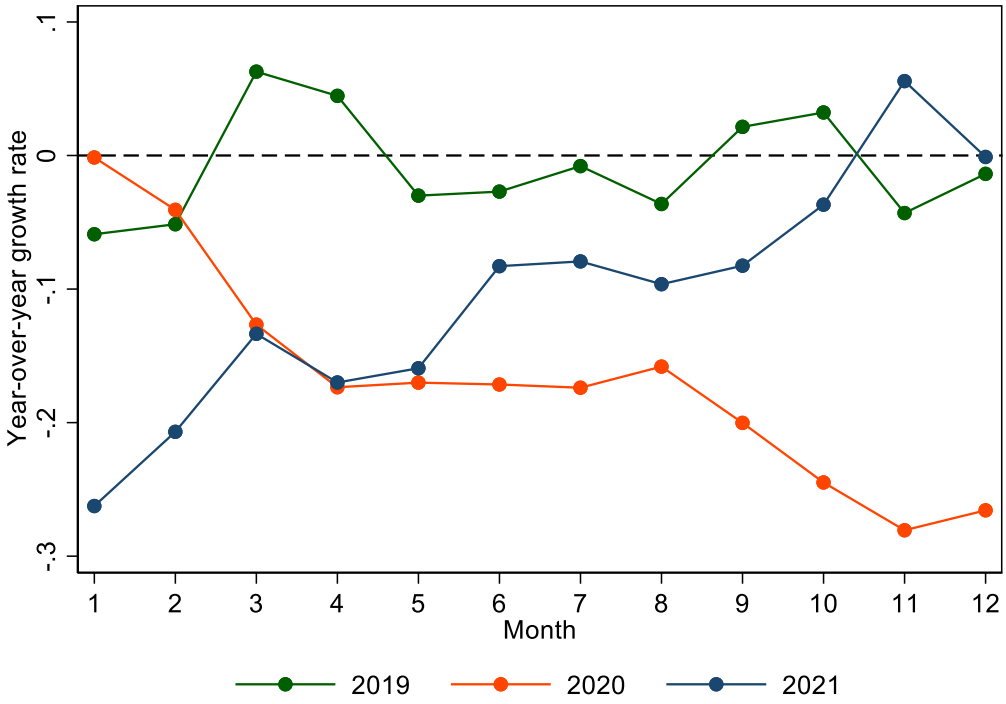

Figure 3a Monthly trends in percentage of total births, by mother's birthplace. February 2020 marks 8 months after the peak of the social movement in June 2019, and September 2020 marks 8 months after the COVID-19 pandemic started in January 2020.

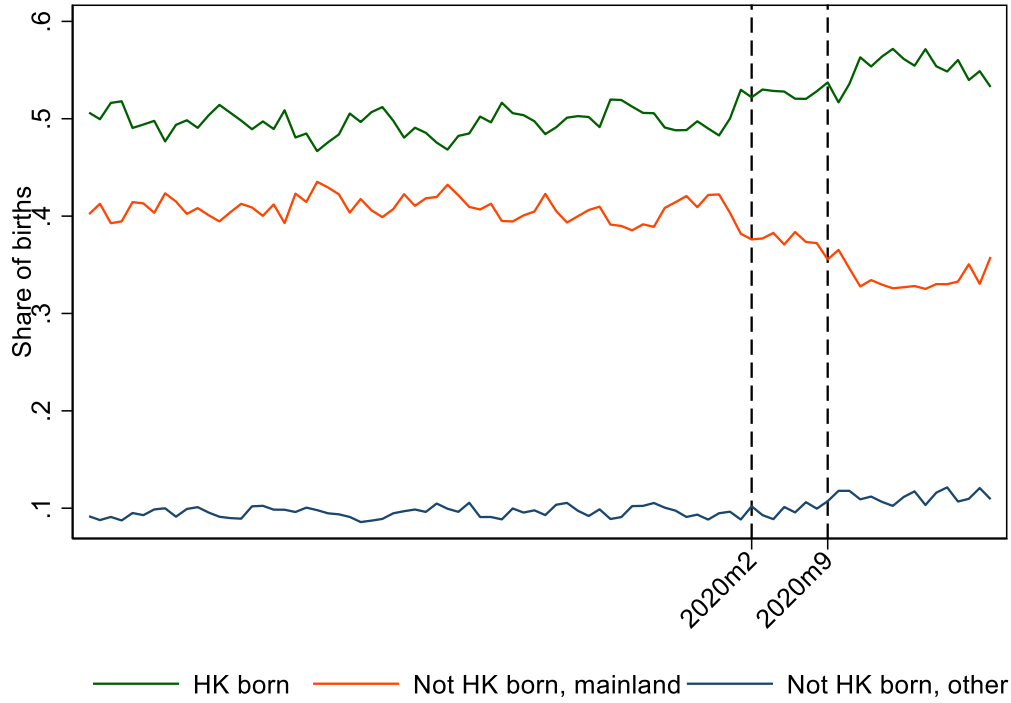

Figure 3b Monthly trends in percentage of total births, by lengths of stay in Hong Kong among non-HK born mainland mothers. February 2020 marks 8 months after the peak of the social movement in June 2019, and September 2020 marks 8 months after the COVID-19 pandemic started in January 2020.

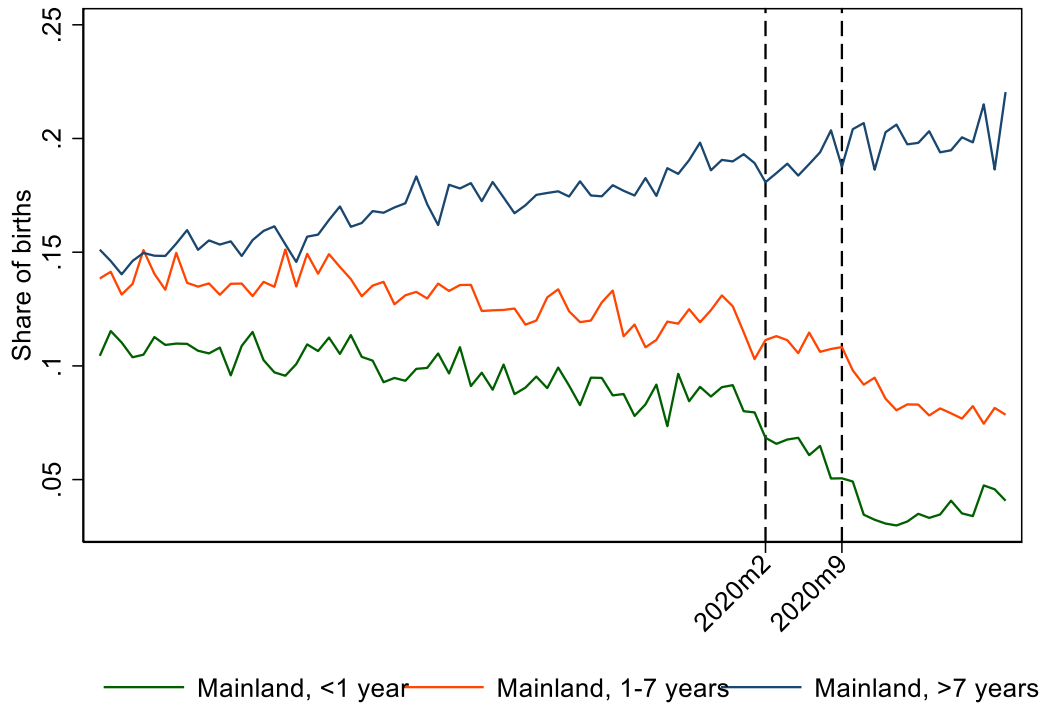

Figure 4 Yearly trends in TFR by mother's birthplace.

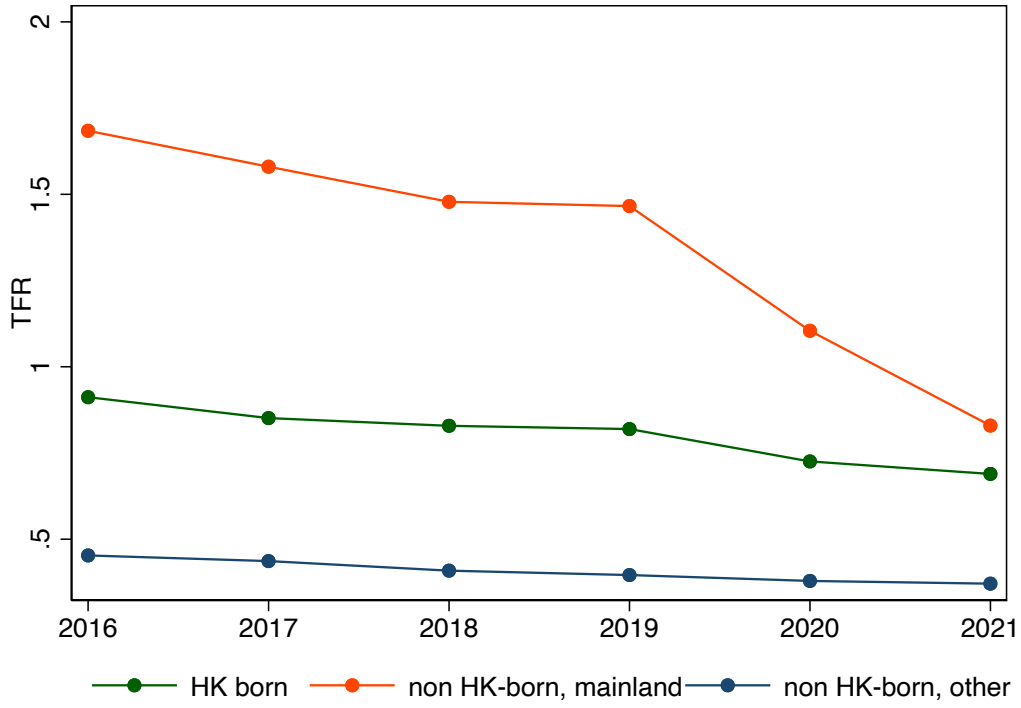

Figure 5 Year-over-year number of all registered marriage

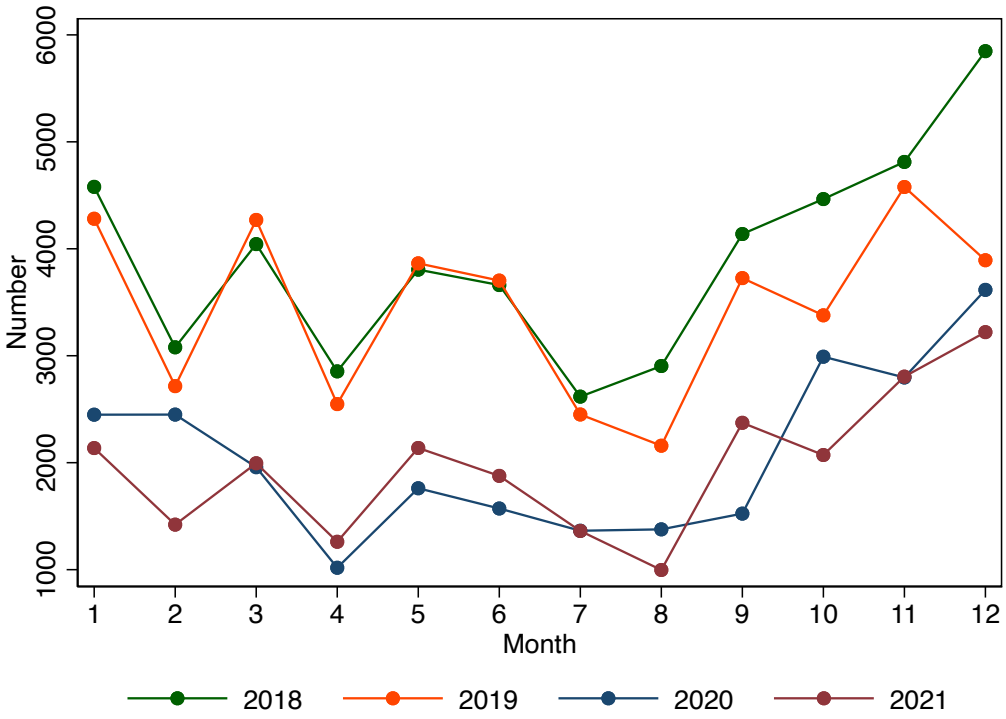

Figure 6 Number of first and non-first marriages, January 2015-December 2021. June 2019 marks the peak of the social movement, and January 2020 marks the beginning of the COVID-19 pandemic in Hong Kong.

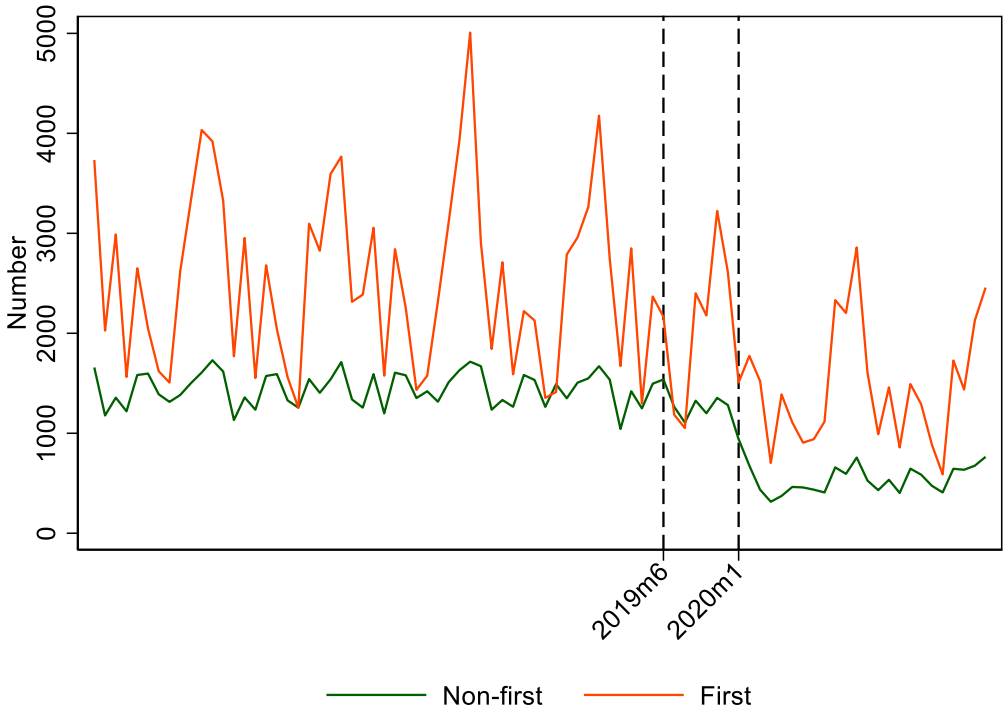

Figure 7 Yearly trends in marriage rates: number of registered marriages per unmarried man/woman aged 16 and above.

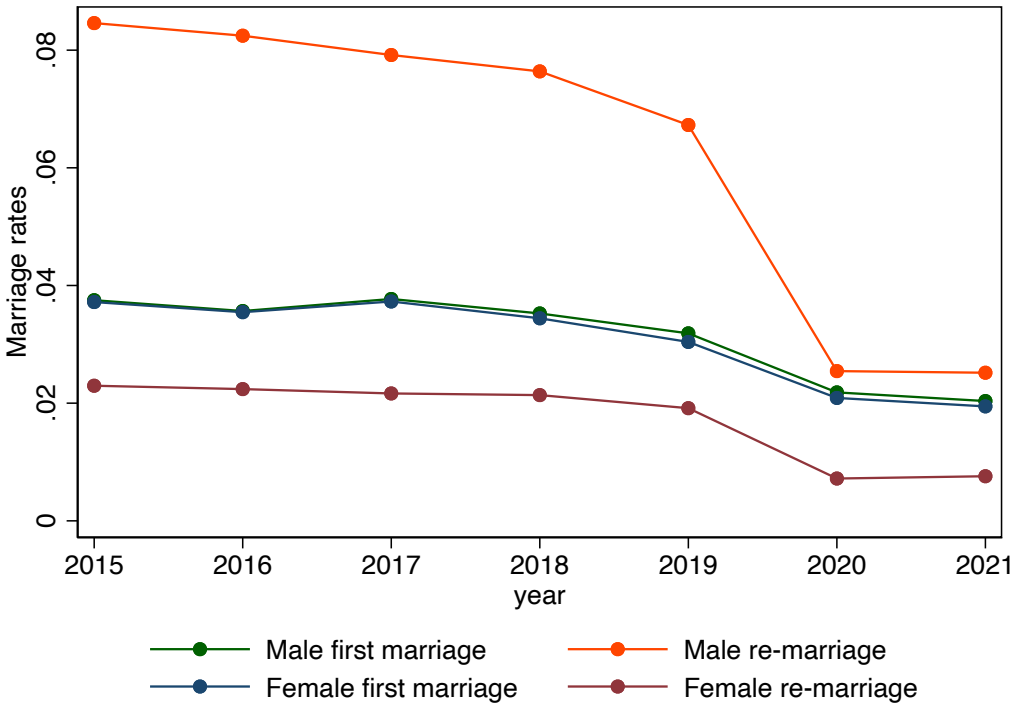

Figure 8a Monthly trends in number of marriages, by couples' birthplace, January 2015-December 2021. June 2019 marks the peak of the social movement, and January 2020 marks the beginning of the COVID-19 pandemic in Hong Kong.

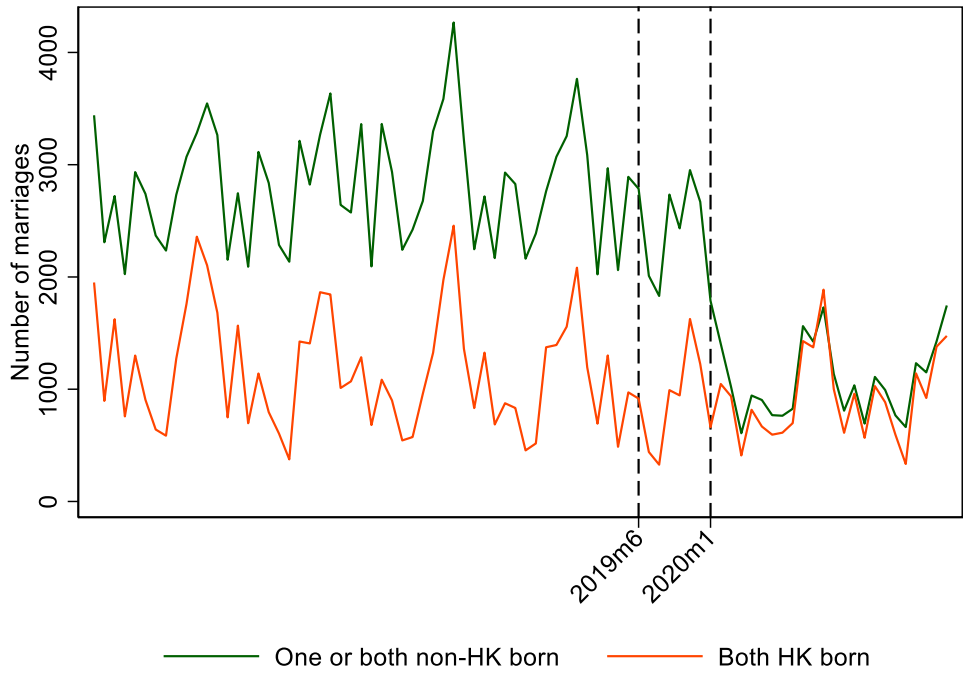

Figure 8b Monthly trends in number of marriages, among non-HK born couples, by couples' prior residence, January 2015-December 2021. June 2019 marks the peak of the social movement, and January 2020 marks the beginning of the COVID-19 pandemic in Hong Kong.