



# COVID-19, marriage, and divorce in Japan

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## Abstract

Using monthly panel dataset of prefectures in Japan, this study explored the effects of stay-at-home policies on the flows into and out of marriage. It was found that these policies significantly reduced both outcomes. According to our estimates, a nationwide state of emergency reduced the number of marriages per 1000 population by 10.4%, while that of divorces was reduced by 27.0%. Moreover, the prefectures designated as the special-precautions area suffered additional reductions with 6.1% and 8.9% for those of marriage and divorce, respectively.

**Keywords** COVID-19 · Marriage · Divorce

**JEL codes** I18 · J12 · R23 · R28

## 1 Introduction

We have witnessed a severe global epidemic of the coronavirus disease (COVID-19) since at least the beginning of 2020, and the pandemic was officially declared by Director-General of the World Health Organization (WHO) Tedros on March 11, 2020. The economic and travel regulations due to COVID-19 have changed our lives drastically both socially and economically. Indeed, more than one hundred countries had implemented policies of full or partial lockdown by the end of March 2020, which affected billions of people. Furthermore, the governments of many countries recommended restricted movements for some or all of their citizens. The World Bank confirmed that the

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COVID-19 pandemic downsized the global economy by 5.2% in 2020, turning out to be the deepest recession since World War II (World Bank, 2020). In such anxious times, the partner is one of the closest people who bring us relief and tell the preciousness of love and connections with others. Meanwhile, the decisions on establishing and dissolving partnership must be carefully made in emergencies. In the face of a perceived unprecedented crisis, how do people respond with their family formations?

A pandemic can affect family formations in many ways; thus, the effects of the COVID-19 pandemic on them are difficult to know. First is the downscale of economic activities. The economic theory of marriage proposes that the decisions of marriage and divorce depend on the relative magnitude of the change in marital gain and the role of the family as insurance. The downscale of economic activities can influence the former through intra-household time allocation (specialization) and housing (economic scale) as a result of its impacts on the relevant markets, and the latter through the changes in the employment status of family members. Second, a pandemic can alter partner relationships through social isolation; it dissuades non-cohabitating couples from having direct contact. It may cause intra-household conflicts, and even domestic violence (DV) under lockdown, or they may simply refrain from submitting their marriage or divorce registrations in fear of infections, which requires them to make their own way to bureaucratic offices. Third, this unexpected event might lead to a change in individuals' preferences because of the social crisis. They may seek a sense of security and feel the importance of existing ties with people. Increasing uncertainty may also prevent people from starting their new lives.

This study examines the effect of the COVID-19 pandemic on family formations, using a regional variation of the regulation level for COVID-19. Specifically, we conducted a difference-in-difference (DID) analysis using monthly panel data from prefectures in Japan from January 2013 to July 2020 (91 months) with its graduated regional regulations. The study shows that the policies against COVID-19 affect the individuals' decisions on both marriage and divorce negatively, after controlling the labor market outcomes. According to our estimations, a nationwide state of emergency reduced the number of marriages per 1000 population by 10.4%, while that of divorces was reduced by 27.0%. Moreover, the prefectures designated as the special-precautions area suffered additional reductions with 6.1% and 8.9% for marriage and divorce, respectively. The study also found that when an area was designated as a special-precautions area for a longer period, the reduction in the number of marriages and divorces was greater.

The rest of the paper is organized as follows. Section 2 explains the related literature. Section 3 presents the measures taken by the government in response to the COVID-19 pandemic, and provides hypotheses with primary evidence. Section 4 describes the data and identification strategy, and Section 5 presents the main results. The final section concludes the paper.

## 2 Related literature

### 2.1 Crisis and family formation

There are several economic theories on family formation, including marriage and divorce. First, marriage and divorce are explained through the individual rational

decisions with a comparison between two marital statuses. Becker (1973) shows that marriage is determined by comparing expected utilities of the status of marriage and remaining single. When the former is larger thanks to their specialization, the individual chooses to get married. Suppose alternatively that children are a major part of the marital gain. When income effects due to stability of earnings dominate the substitution effect arising from the higher opportunity cost of their parents, the economic conditions work in the same direction. Becker, Landes and Michael (1977) applied this concept to explain divorce by comparing the expected utilities under the marriage and divorce. When the marital gain arising from specialization and economic scale is large, the expected utility is higher under the marriage. In addition, when the family plays a role of insurance against negative impacts on their earnings, health, and employment status, people continue to maintain their marital status to avoid the economic vulnerability they would face once becoming single (Shore, 2010; Stevenson & Wolfers, 2007).

The COVID-19 pandemic is considered as one of the events that brought an economic crisis. The studies have investigated the relationship between family formations and the business cycle, making use of the ideas above. The economic marital gains are likely to be damaged by the economic downturn; as male employment tends to be affected more under depressions when it is like a typical recession, the marital gains from specialization will be lower. It is also known that fertility rates tend to decline during recessions (Ananat, Gassman-Pines and Gibson-Davis (2013); Cherlin, Cumberworth, Morgan and Wimer (2013); Schneider & Hastings (2015); Schneider & Hastings (2015); Bellido & Marcen (2019)). If we consider having children as a gain from marriage, countercyclical shocks have a negative impact on marital relationships. Thus, the impact of the pandemic through the change in the marital gain on the family formations is expected to be negative. However, when family plays the role of insurance, the economic downturn is expected to have an opposite effect from that according to the theory of marital gains presented by Becker: It strengthens the family ties, to incentivize them to form a family or continue the relationship (Shore, 2010; Stevenson & Wolfers, 2007). Many scholars have attempted to analyze the relations using data for North America and Europe, finding the effects of the business cycle on family formations are mixed.<sup>1</sup>

The other channel of critical circumstances can also change the structure of family. Natural and human disasters can be taken as an example. Such a crisis involves mental shocks and marital distress, as well as economic shocks. Life-threatening traumatic events can affect the ways of thinking and preferences for families and ties with other people. For example, Cohan, Cole and Schoen (2009) showed that hurricane Hugo reduced the number of marriages and children, while Cohan et al. (2009) found that the 9/11 terrorist attacks reduced the rate of divorce. Empirical studies on family formation during pandemics and major disasters have also been conducted. In Norway, a baby boom occurred following the outbreak of the Spanish Influenza in 1918 and the decline in fertility in 1919. Mamelund (2004)

<sup>1</sup> Marriage (US: Schaller (2013), Ariizumi, Hu and Schirle (2015)). Divorce (US: Amato & Beattie (2011); Hellerstein, Morrill and Zou (2013); Schaller (2013); Baghestani & Malcolm (2014). Denmark: Jensen & Smith (1990). Netherland: Fischer & Liefbroer (2006). Spain: Gonzalez-Val & Marcen (2018). 29 European countries: Gonzalez-Val & Marcen (2017)). For an excellent survey, see Gonzalez-Val & Marcen (2017).

explained this baby boom as a result of the pandemic. His interpretation of the fertility decline in 1919 is twofold: the direct effect where couples refrain from sexual activities fearing infection, and the indirect effect that those who lost a partner due to flu did not remarry for ethical reasons, which was followed by a backlash in terms of the baby boom in 1920.

## 2.2 Impact of COVID-19: men and women

The literature on COVID-19 has also accumulated rapidly. The pandemic forces governments to implement stay-at-home policies, which regulates people to go outside and commute to work and schools. Under these circumstances, female employment is more affected in many countries, which differs from typical recession. This is because the sectors of tourism and retail, which were affected greatly by stay-home policies, have a large share of female employment (Alon et al., 2020; Adams-Prassl, Boneva, Golin and Rauh, 2020). Japan, which is the subject of our analysis, is no exception: Kikuchi, Kitao and Mikoshiba (2020a) showed that the employment of female and young workers is likely to be affected by COVID-19 in Japan.

The COVID-19 pandemic has resulted in new lifestyles and ways of work for families. Sevilla and Smith (2020) found that the pandemic induced a reduction in the gender gap in time use for childcare in the United Kingdom (UK). However, there is different evidence showing that the event took a toll on women in a way of double bind that they suffered from less working time, not only due to the demand side of the labor market, but also the supply side of time allocation accompanied by more childcare under the lockdown (Heggeness, 2020). Adams-Prassl et al. (2020) also showed that women spend more time on childcare than men in the UK and United States (US). Focusing on Japan, Yamamura and Tsutsui (2021a) found that among dual-earner couples with children attending primary school, mothers tended to shift to remote work during the period of school closures due to the spread of COVID-19. However, there was no change in the work patterns of fathers or couples with children attending secondary school or institutions of higher education, suggesting that the childcare burden caused by school closures shifted to mothers who worked remotely.

The lockdown and stay-at-home policies can form an insular and closed environment for couples and families and this worsens the issue of domestic abuse globally with victims having less access to their families, friends, and public support (Taub, 2020; Usher, Bhullar, Durkin, Gyamfi and Jackson, 2020). Unlike pandemics, where infectious diseases spread visibly, domestic abuse and DV in emergencies is also referred to as a *shadow pandemic*, and it spreads invisibly in homes (Mlambo-Ngcuka, 2020). From the early stages of the pandemic, WHO (2020) sounded an alarm over the increase in DV cases, but unfortunately, some evidence indicates that the concern has become a reality. Leslie and Wilson (2020) show that lockdowns in the US increased DV calls substantially, and Beland et al. (2020) provide the mechanism by which DV occurs in Canada with decreasing women's bargaining power due to fewer economic opportunities and social isolation, which makes it difficult for them to access external support. Japan is no exception; compared to the same month of the previous year, the number of consultations about DV increased 58% in April 2020, when the government called for people to refrain from going out and stay at home (Cabinet Office, 2021).

COVID-19 also affects mental health through various routes, including isolation and increased anxiety. Hamermesh (2020) simulates the economy during the COVID-19 pandemic, showing that the happiness of married individuals will increase while that of singles will reduce. Exploiting data from Google Trends, Brodeur, Clark, Fleche and Powdthavee (2021) analyzed the causal effect of lockdowns on the well-being of people. They found a significant increase in the search intensity for boredom, loneliness, worry, and sadness, while those for stress, suicide, and divorce were reduced. Armbruster and Klotzbuher (2020) demonstrate that helpline calls in Germany increased by approximately 20% in the first week of the lockdown, which mainly came from increasing loneliness, anxiety, and suicidal ideation rather than financial concerns, or fear of infection. Its impact on mental health has also been studied in Japan. Yamamura and Tsutsui (2022) revealed that the government's call to stay home prompted people to take preventive actions, but it also increased anger, fear, and anxiety, and these effects were experienced more by women than by men. Kikuchi et al. (2020b) found that it is not only elders whose health was endangered by infections, but also those who were in economically unstable positions were also likely to suffer from severe mental disorders due to the pandemic in Japan. Two studies in Japan also identified the impact of school closures, which were directed at controlling COVID-19 expansion, on mental health. Takaku and Yokoyama (2021) found that school closures had unexpected non-academic effects, such as increased weight gain in children and mental anxiety in mothers. Yamamura and Tsutsui (2021b) found that school closures had a negative impact on the mental health of less-educated women and a limited impact on the mental health of fathers, childless couples, and parents with children attending secondary school or higher.

As such, many factors in addition to those studied in the typical economic crisis are expected to influence family formation during the COVID-19 pandemic. In response to this academic background, we can make several contributions to the literature. First, there are still few studies on the policies of COVID-19 on the family formations. To the best of our knowledge, the only exception is Wagner, Choi and Cohen (2020), who reported that the COVID-19 pandemic reduced the number of marriage applications in Florida, Hawaii, Dallas-Fort Worth-Arlington Metropolitan Area, and Seattle metropolitan area compared to those between 2019 and 2020.<sup>2</sup> We attempt to conduct relatively more formal analysis using a panel dataset for all prefectures, controlling local employment conditions, and separating the effects between nationwide and regional effects. We analyze not only marriage but also divorce to capture the impact of COVID-19 on both family formation and dissolution.

### 3 Background

#### 3.1 Government's response to COVID-19 in Japan

The first government's response to the spread of COVID-19 infection that strongly influenced the public sentiment was a nationwide closure of schools announced by

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<sup>2</sup> Recently, Naito and Ogawa (2021) revealed that the number of pregnancies dropped in Japan due to self-restraint regulations during the COVID-19 pandemic.

Prime Minister Abe on February 27, 2020. With this decision, almost every primary and secondary school in the country was closed from March 2 until the end of May.

After this announcement, however, COVID-19 continued to spread, and in early April, the government declared a nationwide state of emergency, which lasted until May 25. During this period, the public was asked to wear masks, refrain from going out, stop panic buying, and many other behavioral restrictions. One of the features of this pandemic was that it had different effects on different regions. In Japan, the number of infected people per population varied so much across regions that the government applied different policies to different regions. On April 7, 2020, the government designated seven prefectures (Tokyo, Saitama, Chiba, Kanagawa, Osaka, Hyogo, and Fukuoka) under special precautions and asked residents and businesses not only to cancel events and shorten business hours, but even to refrain from commuting.<sup>3</sup> Subsequently, on April 16, six areas (Hokkaido, Ibaraki, Ishikawa, Gifu, Aichi, and Kyoto) were included to the designated prefectures under special precautions, and stronger measures were taken to prevent the spread of infection in these 13 areas, distinguishing them from the other 34 regions.

Afterwards, the government gradually cut back the special precautions area based on the situations of infection in each prefecture. Strictly, the days the prefectures were designated for the special-precautions area are summarized in Table 1. It lasted in the five prefectures of Ibaraki, Ishikawa, Aichi, Gifu, and Kyoto for 29 days from April 16, 2020, to 14 May, 2020 (15 days in April and 14 days in May), in Fukuoka for 38 days from 7 April 2020 to 14 May 2020 (24 days in April and 14 days in May), in Hokkaido for 40 days from April 16, 2020, to May 25, 2020 (15 days in April and 25 days May) in two prefectures, Osaka and Hyogo, for 45 days (24 days in April and 21 days in May) and the four prefectures of Tokyo, Saitama, Chiba, and Kanagawa for 49 days from April 7, 2020, to May 25, 2020 (24 days in April and 25 days in May). Therefore, all 13 prefectures were set as the special-precautions area in April and May 2020, despite the variation in the length of the period in day level.

## 3.2 The marriages and divorces under the pandemic

### 3.2.1 Hypothesis

Here, we summarize the possible impact of the Japanese government's call to stay home and refrain from going outside on people's decisions to marry and divorce.

*Marriage.* First, because Japanese premarital couples often live separately (e.g., living with their own parents or living alone), the curbs on going out and requests to stay at home would mean fewer opportunities for physical contact. This could not only make getting married more difficult but could also have the outcome of causing couples to separate. Furthermore, couples faced with this unusual situation may realize that they have different opinions regarding infection prevention and life risks,

<sup>3</sup> Strictly speaking, the self-restraint based on government call is a request not to go out, which is different from the lockdown with penalties imposed by other countries. People won't be penalized for going out, but most followed the government's request and restricted their activities for months, in April and May (Yabe et al., 2020).

**Table 1** Number of days designated as prefectures under special precautions in 2020

Level	Area	April	May	Total area
Severe 1	Other 34 regions	0	0	0
Severe 2	Ibaraki, Ishikawa, Aichi, Gifu, Kyoto	15	14	29
Severe 3	Fukuoka	24	14	38
Severe 4	Hokkaido	15	25	40
Severe 5	Osaka, Hyogo	24	21	45
Severe 6	Tokyo, Saitama, Chiba, Kanagawa	24	25	49

which is something they may have never realized before, and this, in turn, could lead to their separation. Second, many couples were forced to postpone their wedding because of business shutdowns; the only exception was essential services. Since it is customary to submit a marriage certificate in time for the wedding, the postponement or cancelation of the wedding could also postpone the official submission of the marriage certificate. Third, couples who feel that their lives are at risk due to the pandemic may recognize the importance of family and risk-sharing, which may increase their choice to marry during the crisis.

The first two above-mentioned factors both work in the direction of decreasing the number of marriages; therefore, even if a pandemic causes a decrease in the number of marriages, it is not easy to determine which of these factors could be the main cause. However, as pointed out in the second factor, if couples simply postponed their weddings and marriage registrations due to travel restrictions, curfews, and business shutdowns, there should have been a spike in the number of marriages after the government's request for self-restraint was lifted. In contrast, if couples were separated, as mentioned in the first factor, it is unlikely that there would be a significant increase in the number of marriages a few months after the self-restraint request was lifted. The third effect, through the risk-sharing function of the family, can increase the number of marriages. In fact, many studies have shown that families, including not only couples but also their relatives, have a risk-sharing function. For example, Rosenzweig and Stark (1989) used a household dataset in India to demonstrate that parents tended to marry their daughters into locationally distant families. They aimed to show that marriage played the role of an implicit inter-household contract, which mitigated income risks and contributed to consumption smoothing. Moreover, using an Indian household dataset, Rosenzweig and Wolpin (1985) showed that intra-generational kinship can facilitate occupational diversification and thus reduce income risks. Generally, kinship relations can play a role in mitigating adverse shocks when the economy is characterized by an imperfect market in the developing world. However, Halla and Scharler (2012) show that marriage (the share of married individuals) could reduce local economic shocks, even in the US with a relatively mature market, and that its effect was more substantial in unfavorable financial situations. The COVID-19 pandemic poses significant risks across regions and countries. To cope with unexperienced risks in this regard, people may rely on family and kinship relations for economic stability.

*Divorces.* Several possible routes could affect decisions regarding divorce among couples forced to stay at home due to COVID-19. The first is an increase in the number of divorces associated with DV. Even if it does not involve DV, differences in personal values, which couples may recognize because of the unusual circumstances of the pandemic, may form one factor leading to increased divorce rates. In Japan, the type of couples' separation caused by differences in terms of values or DV, which arose during this period, is called *corona rikon* (corona divorce); it has been covered by the media. Second, some couples may have decided not to divorce because they recognized the value of forming a family and the significance of maintaining the current form of their marital status. The risk-sharing function played by couples and families can be perceived more strongly during a pandemic. Third, some couples may have postponed their divorce decision for a certain period because of restrictions placed on their freedom to leave the house. Another possibility is that couples have other practical reasons that prevent them from deciding to divorce. For example, worsening economic conditions and the difficulty of moving back into parents' homes or renting new housing may form some of the practical factors that discourage the decision to divorce.

The first factor clarifies that the government's request for self-restraint could increase the number of divorces. In contrast, the second and third factors work in the direction of decreasing the number of divorces. However, if the third factor is the main cause of the decline in divorce decisions during the pandemic, then there should be a spike in the number of divorces once the government's call to stay at home ends and the economic environment improves. However, if the second factor is the cause, the number of divorces will not increase after the government's request for restraint ends.

In the following sections, we conduct a DID analysis with these implicitly assumed hypotheses. Furthermore, by looking at the trends in the preliminary number of marriages and divorces following the lifting of the government's call for curfews and stay-at-home policies, we attempt to infer the factors that drive these results.

### 3.2.2 Evidence at a glance

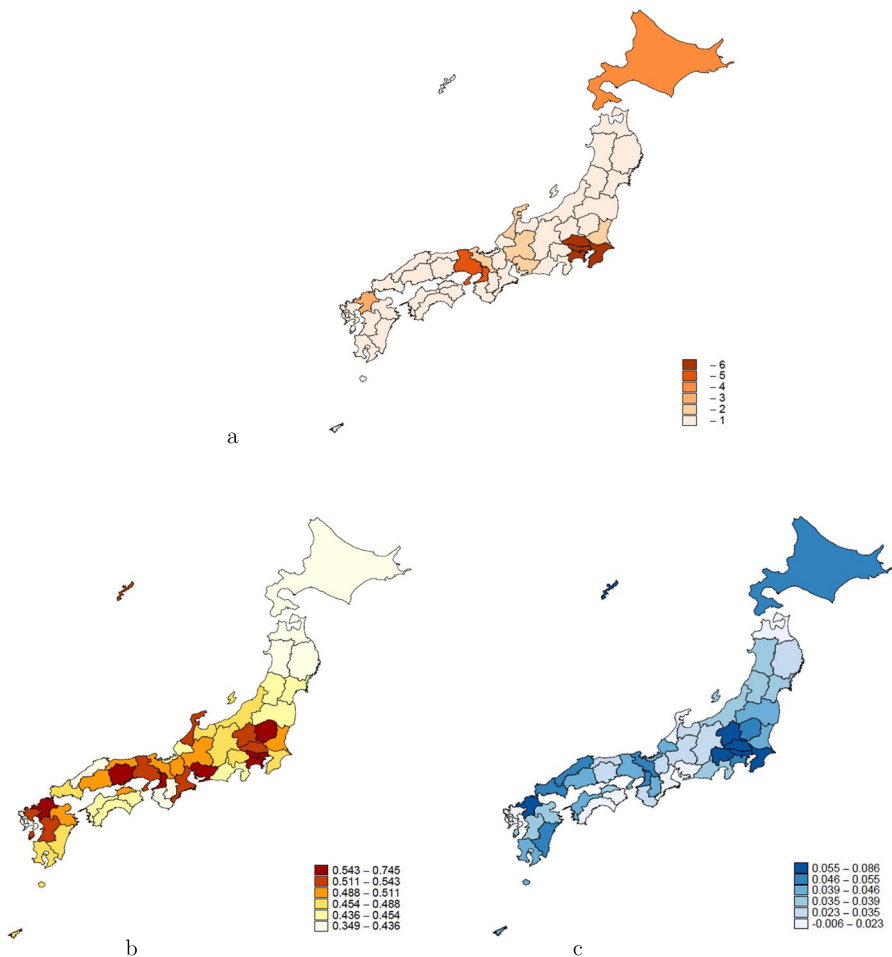
The impact on the number of marriage and divorce of COVID-19 and the government's call for self-restraint aimed at preventing its spread was significant in Japan: just before the first wave of COVID-19 hit Japan, the number of marriages in the two months of February and March increased by 19.7% compared to the same two months the year before. However, it decreased by 45.8% in the two months of April and May.<sup>4</sup> The same trend can be seen in the number of divorces: the number of divorces in the two months from February 2020 increased by 1.5% compared to the same two months last year. However, between April and May 2020, the number of divorces dropped by 25.5%.

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<sup>4</sup> 2019 was the year of the Emperor's change, which led to a marriage boom. Therefore, when we compare the number of marriages in 2020 with 2018 to remove its impact, the number of marriages in the first two months of February increased by 5.5%, while the number of marriages in the first two months of April decreased by 29%.



To understand the destructive relationship between the policy, marriages, and divorces graphically, we make comparisons using maps. Figure 1a shows the map of Japan colored depending on the length of period that the prefecture was designated as the special-precautions area. The darker color indicates the area that the stay-home restriction was implemented for a longer period. The specific levels are listed in Table 1. Figure 1b shows the map colored in different shades with the numbers of marriages per 1000 population who were aged 15 and over in May 2019 subtracted by that of May 2020. Figure 1c is the same, but colored for the gap of divorces. Comparing these figures, we can see that the prefectures chosen for the area-specific policy tended to experience a major drop in the numbers of marriages and divorces.



**Fig. 1** **a** Length of periods when special precautions were required. *Note.* Darker colors represent areas that have been designated as areas requiring special precautions for a longer period of time. **b** Decline in the number of marriages per 1000 population. **c** Decline in the number of divorces per 1000 population. *Note.* The figures show differences in the number of marriages (Fig. 1b) and divorces (Fig. 1c) per 1000 people between May 2020 and the same month in the 2019. Darker colors indicate the areas where the rate of decline is greater than that for the same month of the previous year.

These figures indicate that the COVID-19 pandemic and government restrictions have reduced incentives for people to marry or divorce, or have given them incentives to postpone their decisions. However, from these descriptive facts, it is not clear through what pathway the pandemic caused decreases in number of marriages and divorces. Furthermore, these figures alone lack statistical reliability, making it difficult to quantitatively assess the impact of the measures taken by the government. Viewing the two policies of declaring a state of emergency and designating prefectures under special precautions as a social experiment, this paper analyzes the impact of the spread of the COVID-19 infection and the government's request for self-restraint in certain areas on decision-making on marriage and divorce by conducting a difference-in-differences analysis, with 13 regions as designated prefectures under special precautions as the treatment group and 34 other areas as the control group.

## 4 Data and methodology

### 4.1 Data

In this subsection, we explain the data used in our analysis. We use panel data for 47 prefectures (nearly equivalent to states in the US) in Japan from January 2013 to July 2020 (91 months), which is all the accessible data at present of January 2021. The data include the period when the policies against COVID-19 of our research interest were implemented. In particular, as we discussed in the previous section, the period was April and May 2020, when a nationwide state of emergency was announced, and the treatment group of 13 prefectures was chosen for the special-precautions area.

There are three sources of our dataset. The first one is Vital Statistics which is administrated by the Ministry of Health, Labour and Welfare of Japan. Vital Statistics is a complete survey and the information on births, deaths, marriages, and divorces by prefectures are reported monthly. From this data source, we used the information on the numbers of marriages and divorces for each prefecture. To be precise, we use the definitive numbers that are announced five months later since the survey is conducted.

Second, we use the data from Census held by the Ministry of Internal Affairs and Communications of Japan to calculate the numbers of marriages or divorces per 1000 population of people aged 15 years and over. In Japan, women can marry at the age of 16 and men at the age of 18. Thus, we utilize the population of people aged 15 and over. While the other data is collected monthly, this information is only available yearly for prefectures resulting in being interpolated between census years. Specifically, our dependent variables are calculated by dividing the numbers of marriages or divorces of each prefecture by the population of people who are aged 15 and over.

Finally, we use the information from the Job/Employment Placement Services Statistics (General Employment Placement Situation) to take account of labor market conditions. This database is also administrated by the Ministry of Health, Labour and Welfare of Japan, and the survey is conducted monthly. Using this database, we calculate two variables: the jobs-to-applicants ratio and the ratio of female-to-male employment rates. The former indicates the number of job offers per job seeker, calculated by dividing the

number of jobs by the number of applications for new jobs. The latter is the employment rate of women divided by that of men, where the employment rate is the number of people who find a job divided by the number of new job seekers in a given month.

These control variables are used to separate the effects of the policies on COVID-19 between the effects of labor market conditions, which is traditionally discussed in the studies on the economic crisis, and those of other factors specified in the COVID-19 pandemic such as the impact of social isolations. As exiting studies found, the jobs-to-applicants ratio is considered to have positive impacts on marital relations: positive (negative) effects on the number of marriages (divorces) when economic theory of marital gain holds and that the gain largely comes from affordability of children. On the other hand, if marriage plays a role of insurance of family members, the effect is expected to have the opposite effects on the marital relations: negative (positive) effects on the number of marriages (divorces). The female-to-male employment rates is considered an implicit indicator of gender equality in the employment situation. As this trend reduces marital gain from specialization, negative effects on marital relations are expected from Becker’s theory of marriage. In contrast, although the sign of the overall effects is ambiguous, the relative bargaining power of women may also influence the number of marriages and divorces.

Table 2 reports the summary statistics of the variables.

### 4.2 Estimation model

To investigate the effects of the stay-at-home policies against COVID-19 on the individuals’ marital decisions, we start our analysis based on the following estimation model:

$$y_{it} = \beta_1 ALERT_t + \beta_2 AREA_{it} + \gamma X_{it} + \eta_i + \phi_t + \varepsilon_{it}, \tag{1}$$

where  $y_{it}$  is either the logarithmic numbers of marriages or divorces per 1000 population aged 15 and over in prefecture  $i$  in month  $t$ .  $ALERT_t$  denotes the binary indicator for whether a nationwide state of emergency is implemented in the month  $t$ .  $AREA_{it}$  also stands for the binary indicator for whether the prefecture  $i$  is designated for the special-precautions area in month  $t$ . We also conduct an estimation substituting  $AREA_{it}$  with the numbers of days the prefecture  $i$  was designated the special-precautions area in month  $t$ .  $X_{it}$  is a vector of control variables including the jobs-to-applicants ratio and gender equality in the employment rate in prefecture  $i$  in month  $t$ .  $\eta_i$  controls the prefecture fixed effects, which control for time-invariant differences across prefectures, whereas  $\phi_t$  denotes the time-fixed effects, which does the monthly trends. For instance, May 2019 is the timing of imperial succession, and a new Japanese era began. Many young couples got married in the month starting their new lives. The latter fixed effect contains such monthly specific trends throughout the nation. Finally,  $\varepsilon_{it}$  represents the error term. The standard errors in all regression models were clustered at the prefecture-level.

Alternatively, we conduct another estimation with the different specification. In the analysis, we exploit the variations of the length of period that the prefecture was designated as the special-precautions area. We regard this difference as a proxy for the severity of the COVID-19 pandemic and policies to deal with it. For this, we set the indicator variables as  $SEVERE_{ji}$ , depending on the levels ( $j = 1, 2, 3, 4, 5$  and  $6$ ). We assign  $SEVERE_{1i} = 1$  to prefecture  $i$  without the area-specific policy and  $SEVERE_{6i} = 1$  for prefecture  $i$  where the policy lasts for the longest as 49 days. Using

**Table 2** Descriptive statistics

	mean	sd	min	max
MARRIAGE	0.428	0.103	0.179	1.099
DIVORCE	0.158	0.031	0.072	0.355
ALERT	0.022	0.147	0	1
AREA	0.006	0.078	0	1
DAYS_PER_MONTH	0.119	1.567	0	25
SEVERE1	0.723	0.447	0	1
SEVERE2	0.106	0.308	0	1
SEVERE3	0.021	0.144	0	1
SEVERE4	0.021	0.144	0	1
SEVERE5	0.043	0.202	0	1
SEVERE6	0.085	0.279	0	1
EMPLOYMENT	1.304	0.329	0.440	2.150
GENDER	0.532	0.068	0.371	1.344
Observations	4277			

Observations are at the prefecture month level. This study includes 47 prefectures from January 2013 to July 2020. MARRIAGE and DIVORCE indicate the number of marriages or divorces per 1000 people aged 15 and above, respectively. ALERT is a binary indicator of whether a nationwide state of emergency is implemented in the month. If it is either April 2020 or May 2020, it takes one. AREA is a dummy variable indicating whether the prefecture was designated as a special-precautions area in the month. It takes one if the prefecture was designated for the special-precautions area and that it was either April 2020 or May 2020. DAYS\_PER\_MONTH is the length of the period in which the prefecture was designated as a special-precautions area in the month. The dummy variables SEVERE1-SEVERE6 are defined in Table 1. Specifically, SEVERE1 takes one if it was 34 prefectures that were not chosen for the special-precautions area. SEVERE2, SEVERE3, SEVERE4, SEVERE5, and SEVERE6 take one if it is the prefectural precautions area for 29, 38, 40, 45, and 49 days, respectively. EMPLOYMENT denotes the jobs-to-applicants ratio, calculated by dividing the number of jobs by the number of applications for new jobs. GENDER indicates the employment rate of women relative to that of men

these dummy variables, we estimate the following equation.

$$y_{it} = \sum_{j=1}^6 \xi_j (ALERT_t \times SEVERE_{ji}) + \psi X_{it} + v_i + \lambda_t + \epsilon_{it}, \quad (2)$$

where  $y_{it}$  denotes the same dependent variable as that in (1).  $ALERT_t$  is again the binary indicator for whether a nationwide state of emergency is implemented in the month  $t$ .  $SEVERE_{ji}$  is a dummy variable whether prefecture  $i$  applies to the level of severeness with  $j$  measured by the length of period that the prefecture was designated as the special-precautions area as shown in Table 1. Note that coefficient  $\xi_1$  solely corresponds to the effect of the nationwide state of emergency compared with the

normal time. We expect  $\xi_6$  to be greater than the other coefficients  $\xi_j$ . Now,  $v_i$ ,  $\lambda_t$ , and  $\varepsilon_{it}$  are prefecture fixed effects, time fixed effects, and the error term, respectively.

### 4.3 Trend

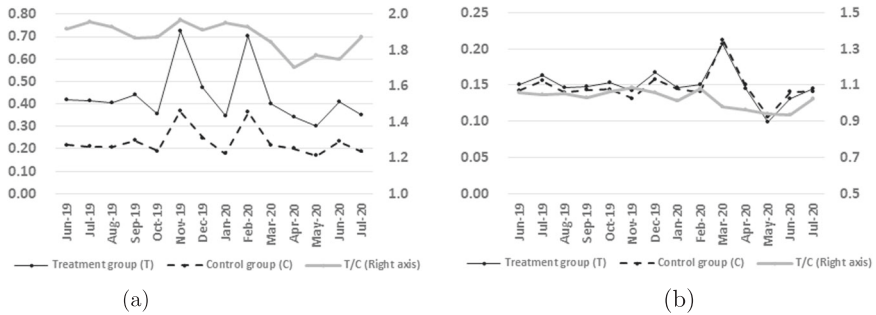
In this section, we describe trends in the number of marriages and divorces between the treatment and control groups to discuss the parallel trend assumption. To this end, in Figure 2, we present the number of marriages and divorces per 1000 people for a 2-year period from June 2018 to July 2020, which includes April and May 2020, when the government asked people to refrain from going out and staying at home.

Figure 2a shows the number of marriages per 1000 population. The solid black line measured on the left axis represents the value of the treatment group, which consists of 13 prefectures where special precautions have been legally applied. The dotted line represents the change in the control group, which consists of 34 other prefectures. The number of marriages per 1000 people in the treatment group was higher than that in the control group because the former included more urban areas, and thus, had a larger young population than the latter. The solid gray line measured on the right axis shows the value regarded as the ratio of the values of the treatment and control groups; this aimed to observe the movement of the values of the two groups. While there was a notable increase in the number of marriages in November 2019 and February 2020, the value of the solid gray line representing the trend of the two groups remained stable from 1.9 to 2.0 until March 2020.<sup>5</sup> However, in April 2020, this value fell sharply to approximately 1.70. Subsequently, the value gradually increased to return to the original trend, and as of July 2020, the value was 1.87. This suggests that while the assumption of a parallel trend for the number of marriages was met for the two groups before the first wave of COVID-19 hit Japan, the government's designation of areas requiring special precautions in April 2020 may have had a significantly different impact on the two groups.

A similar trend can be seen in Figure 2b, which shows the number of divorces per 1000 people. Before March 2020, the number of divorces per 1000 people was generally the same for the treatment and control groups.<sup>6</sup> Specifically, the ratio of the values of the two groups, indicated by the gray line, remained slightly above 1. After March 2020, the number of divorces began to decline in both groups, but the decline in the number of divorces in the treatment group was particularly large. This can be confirmed by the fact that the gray line has been declining since March and that, in

<sup>5</sup> As in previous years, the number of marriages in November 2019 was higher than in that in other months because of a popular Japanese tradition, according to which good marital relations accrue to couples who get married on November 22. Possible reasons for the increase in the number of marriages in February 2020 are mixed. In a normal year, the number of marriage registrations increases in March in preparation for the new fiscal year, which begins in April. However, February 2020 was a leap month, which only occurred once every four years, so more couples may have registered their marriages on February 29. Another possibility is that there was a mass outbreak of COVID-19 aboard the *Princess Diamond*, a cruise ship docked in Japan in February 2020. This may have caused couples who had planned to submit their marriage registrations in March to move up their submissions by one month because of the expected spread of the infection.

<sup>6</sup> The number of divorces increased in both the groups in March, which is normal for most years. In Japan, the new fiscal year for schools and public/private workplaces begins in April, so the number of divorces and marriages is higher in March than in other months as people prepare for their new lives.



**Fig. 2** Number of marriages and divorces per 1000 people. **a** Marriages. **b** Divorces. *Note.* Almost all schools in Japan began to close on March 2, 2020, and 13 prefectures were designated as requiring special precautions during the 2 months of April and May 2020. All designations were lifted on May 25, 2020. The specific numbers of designated days are listed in Table 1

February 2020, the ratio of the two groups indicated by the gray line was 1.078, but it dropped below 1 for the first time in the following three months and dropped significantly to 0.963 in April. The decrease in the ratio of the two groups continued after May and reached 0.935 in June. This indicates that although the number of divorces in the treatment and control groups remained at the same level until February 2020, and that the parallel trend assumption for the number of divorces was generally satisfied, the two groups were affected differently compared to the previous trend after March 2020, and this lasted for at least two months until June 2020.

## 5 Results

### 5.1 Estimation results

In this section, we discuss the estimation results.

*Marriage.* According to the baseline results in column 1 of Table 3, the number of marriages dropped by 10.0% in the two months following April, 2020, when the state of emergency was declared and people were asked to stay at home. The coefficient of the specific area in the second row is negative as expected. It is observed that the number of marriages was significantly lower at 6.1% in the 13 prefectures where special precautions were required than in other regions.

To understand the mechanism of COVID-19 on the marriage decisions, we further control the labor market conditions: the jobs-to-applicants ratio and the relative female employment rate. Columns 2 through 4 show the results when the analysis is controlled for these economic factors related to employment. The results of the three models are very stable, and the results obtained can be summarized based on Column 2 as follows: First, the number of marriages fell by 10.5% owing to the stay-at-home policy demanded by the government uniformly across the country. Second, the government's designation of 13 prefectures as prefectures in need of special precautions did have a significantly different impact at 6.1% on the number of marriages in these areas compared to other areas. Third, the jobs-to-applicants ratio increased

**Table 3** Estimation results: Marriage

	(1)	(2)	(3)	(4)
ALART	-0.100*** (0.013)	-0.105*** (0.013)	-0.104*** (0.013)	
AREA	-0.061*** (0.016)	-0.061*** (0.017)		
DAYS_PER_MONTH			-0.003*** (0.001)	
ALART × SEVERE1				-0.105*** (0.013)
ALART × SEVERE2				-0.137*** (0.016)
ALART × SEVERE3				-0.140*** (0.009)
ALART × SEVERE4				-0.112*** (0.010)
ALART × SEVERE5				-0.145*** (0.018)
ALART × SEVERE6				-0.230*** (0.013)
EMPLOYMENT		0.054*** (0.015)	0.055*** (0.015)	0.055*** (0.015)
GENDER		-0.044 (0.028)	-0.044 (0.029)	-0.044 (0.029)
Fixed time effects	yes	yes	yes	yes
Observations	4277	4277	4277	4277

The dependent variable is the logarithmic number of marriages per 1000 population aged 15 years and over. \*\*\*, \*\*, and \* indicate that the estimates are significant at the 1%, 5%, and 10% levels, respectively. The standard errors in all the regression models are clustered at the prefecture level and are shown in parentheses

the number of marriages by 5.4%. Forth, the number of marriages is negatively affected by the ratio of female-to-male employment rates, but not significant.

Column 3 shows the result obtained by using days in month  $t$  that prefecture  $i$  has been subject to the area-specific policy  $AREA_{it}$ . The result indicates that one-day increase in the period of area-specific policy induces a reduction in the number of marriages per 1000 population at 0.3%, implying with a simple calculation that the policy decreased marriages per 1000 population by 7.5% in Tokyo, one of the most severe prefectures where the policy implemented for 25 days in May, 2020.

Column 4 provides the results obtained by estimating Eq. (2). The cross-term of  $ALARM_t \times SEVERE_{1i}$  stands for the effect of a declaration of a state of emergency for the prefectures that were not designated as area-specific policies. The cross-term extends from that of  $ALARM_t \times SEVERE_{2i}$  to  $ALARM_t \times SEVERE_{6i}$  with the length of the area-specific policy period (a proxy for the severity of the pandemic and measures to address it). The results show a relatively monotonic negative relationship between the length of policy or severity of the pandemic and the number of marriages.

The findings indicate that our main results are robust under the control of labor market conditions. This suggests that marital decisions can be affected by the COVID-19 pandemic through a vague sense of uncertainty as well as the regional-specific effects with the stricter regulations. The results of the control variables mean that the higher jobs-to-applicants ratio leads to a larger number of marriage registrations. This is consistent with the theory of marriage presented by Becker if we assume the marital gain such as children is important for the marital decisions and that its income effect matters. On the other hand, the number of marriage registrations decreases (but not significantly) when the women's employment condition was better than that of men. This result implies again that Becker's theory based on marital gains applies to our case since this trend tends to reduce the marital gain.

*Divorce.* Table 4 shows the impact of the government's request to stay at home to prevent the spread of COVID-19. Column 1 shows the results when the analysis was not controlled for economic factors. This shows that the number of divorces decreased by 27.5% when a state of emergency was declared. In addition, the coefficient of the intersection term in the second row is negative and significant, indicating that the decline in divorce was 8.8% larger in the 13 prefectures where special precautions were required than in other regions.

Columns 2 through 4 show the results of an analysis that controls for economic factors using employment data. Based on Column 2, the results obtained from these analyses are as follows: First, the number of divorces fell by 27.0% owing to the declaration of a nationwide state of emergency, requiring people to stay at home. Second, the number of divorces dropped by 8.9% in the 13 prefectures where stronger self-restraint was requested to stop the spread of infectious diseases compared to the other regions. Third, a one percentage point drop in the jobs-to-applicants ratio increases the number of divorces by 4.6%.

Column 3 is the estimation result using for  $AREA_{it}$  the days in month  $t$  the area-specific policy is implemented in prefecture  $i$ , showing that a one-day increase in the period of policy leads to a decrease in divorces per 1000 population by 0.5%. A simple calculation suggests that the Tokyo experienced a decline of 12.5% with an area-specific policy of 25 days. Column 4 gives the estimation results for Eq. (2). According to the results, again, we can see that the number of divorces decreases monotonically with the length of the policy period.

In Columns 2 through 4, we also find that the main results are not affected by the control of labor market conditions. Specifically, when the jobs-to-applicants ratio is higher, the number of divorce registrations is likely lower. This is now consistent with the theory of marriage as insurance in the case of divorce.

Using the estimates presented in Tables 3 and 4, we summarize our findings regarding the impact of the COVID-19 pandemic and measures taken by the government on marriage and divorce. First, even when controlling for the impact of changing employment conditions, the number of marriages and divorces both declined significantly during the period when requests for COVID-19-related self-restraint and stay-at-home orders were made. Second, the negative impact on the number of marriages and divorces was greater in the treatment group that had been designated as a special-precautions area than in the control group. In particular, the negative impact was greater in areas that had been designated as special alerts for a longer period of time. Third, while government policies affect marital decisions, the



**Table 4** Estimation results: Divorce

	(1)	(2)	(3)	(4)
ALART	-0.275*** (0.022)	-0.270*** (0.022)	-0.268*** (0.022)	
AREA	-0.088*** (0.019)	-0.089*** (0.019)		
DAYS_PER_MONTH			-0.005*** (0.001)	
ALART × SEVERE1				-0.270*** (0.022)
ALART × SEVERE2				-0.315*** (0.019)
ALART × SEVERE3				-0.370*** (0.015)
ALART × SEVERE4				-0.303*** (0.016)
ALART × SEVERE5				-0.353*** (0.023)
ALART × SEVERE6				-0.429*** (0.018)
EMPLOYMENT		-0.046* (0.026)	-0.045* (0.026)	-0.045* (0.026)
GENDER		-0.020 (0.033)	-0.020 (0.033)	-0.020 (0.033)
Fixed time effects	yes	yes	yes	yes
Observations	4277	4277	4277	4277

The dependent variable is the logarithmic number of divorces per 1000 population who are aged 15 years and over. \*\*\*, \*\*, and \* indicate that the estimates are significant at the 1%, 5%, and 10% levels, respectively. The standard errors in all the regression models are clustered at the prefecture level and are shown in parentheses

difference in the coefficients indicates that those of divorce are more sensitive to policies. Married couples may have been more likely to postpone their divorce decisions because they had a stronger incentive to maintain the status quo in the event of an unusual situation because of the status quo bias and endowment effect, as pointed out in behavioral economics. Fourth, although the results for labor market conditions are beyond our main focus, the motivation for marriage in Japan relies more on the theory of marriage presented by Becker, while that of divorce supports the theory that marriage plays a role of insurance for family members.

### 5.2 Background of the decline in marriage and divorce

The number of marriages and divorces has declined significantly during the period of self-restraint requests associated with the spread of COVID-19. In this section, based on the hypotheses in Section 3.2.1, we explore the possible causes of such behavioral changes based on the available data.

*Marriage.* There are two possible reasons for the decline in the number of marriages. First, marriage registration might have been postponed. There were some cases in the media where weddings had been canceled or postponed because

of the closure of wedding halls at the request of the government during April and May 2020, and marriage registration may have been postponed accordingly. Furthermore, status-quo bias may have played a role in this unusual situation. In a situation of increased uncertainty, people tend to maintain the status quo until the situation calms down. Second, couples facing an unusual situation may have dissolved their marriage-oriented relationships because they became aware of the differences in each other's values or their preferences and values themselves have changed. For couples who lived separately before marriage, the COVID-19 restrictions required each individual to stay at home, thus making it difficult for couples to spend time together. It also challenged people's perceptions of their preferences regarding infection risk and post-infection mortality, and their perceptions of their current and future economic circumstances. Couples who became aware of their differences in values and other factors may have ended their relationships.

Of these two reasons, if the former is the primary cause of the decline in marriages, there should be a spike in the number of marriages after the lifting of the precaution area designations. This is because if the stay-at-home requirements are the only reason for the postponement of weddings and marriage registrations, marriage registrations are likely to be submitted after the government's request for self-restraint is lifted. If the latter is the main reason, then there should not be an increase in the number of marriages in the next few months compared to previous years.

To find a plausible reason for the decline in the number of marriages, we compared the year-over-year percentage change in the preliminary number of marriages in the six months starting from July to December 2020 with those of 2019. With this comparison, we aim to relativize the magnitude of the policy impact, as those of 2019 can reflect the broader trend before the COVID-19 pandemic. The year-over-year percentage change in marriage in the period from July to December 2020 (based on that of 2019) was  $-10.6\%$  for the treatment group and  $-9.2\%$  for the control group. On the other hand, the year-over-year percentage changes in marriages from July to December 2019 (based on that of 2018) were only  $-0.4\%$  and  $-3.1\%$  for both groups. Suppose that the decline in the number of marriages in April and May 2020 was simply due to the postponement of marriage registrations. In this case, the year-over-year change rates of the number of marriages after lifting the policy should have been more positive than  $-0.4\%$  and  $-3.1\%$ . However, since such repercussions were not found, the COVID-19 pandemic and the government's request may have had a substantial impact on the incentives for family formation, including forcing the dissolution of partnerships, changing preferences, or affecting marriage-related values among young people.

*Divorces.* There may also be multiple factors that explain the decline in the number of divorces during the period of governmental requests for self-restraint. The first possible reason is that the filing of the divorce was simply postponed, even though the number of people preparing for divorce actually increased. Given the increase in DV in Japan, it is not surprising that the number of divorces has also increased. The fact that the number of divorces decreased significantly after April 2020 may indicate that many couples were forced to postpone their divorce. The second possible reason is that the number of divorces declined because couples

began to reconsider the value of their family because of the COVID-19 pandemic. According to an online survey conducted by Meiji Yasuda Life Insurance in October 2020 (1620 valid responses), 19.6% of couples answered that they got along better because of COVID-19, while only 6.1% answered that they got along worse.<sup>7</sup> The most common reason given for “getting along better” was “more opportunities for communication and conversation” (62.5%) due to the increased time spent at home as a result of the emergency declaration.

The above two reasons seem to be contradictory, but either can be a factor in the decline in the number of divorces. However, if the decline in divorces in April and May 2020 is attributed primarily to the postponement of divorce filings, the number of divorces should show a spike after the government’s calls for self-restraint ended. In contrast, if there has been no increase in the number of divorces since the self-restraint request was lifted, the decrease in divorces can be attributed to the second reason. To explore the reason for the changes in its number, let us again compare the year-over-year percentage changes of divorces in the six months from July to December 2020 with those of 2019. The year-over-year percentage change in the number of divorces in the six months of 2020 (based on 2019) was  $-5.2\%$  for the treatment group, in the control group was  $-4.8\%$ . Whereas those of 2019 (on the basis of 2018) were  $-1.9\%$  and  $-2.2\%$ , respectively. If the decline in the number of divorces in April and May 2020 was simply due to the postponement of filing divorce papers, it would not be surprising that there was an unusual spike in the subsequent period of policy cancelation. However, the comparison finds further declines of about  $5\%$  for both groups after the policy. This implies that the decrease in the number of divorces in April and May 2020 can be attributed not only to the postponement of divorce filing, but also to more fundamental influences such as reevaluation of the meaning of being married.

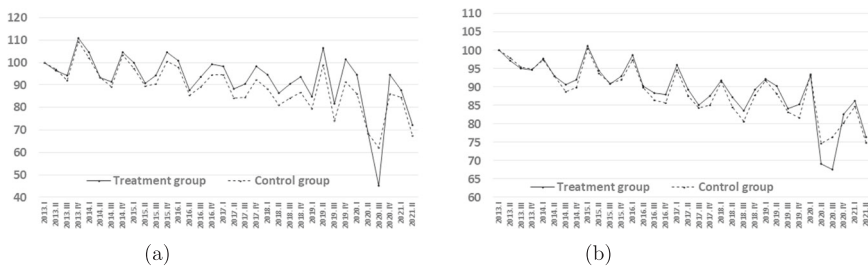
However, the factors behind the decline in marriage and divorce rates need to be carefully examined. Specifically, it makes us aware of the seriousness of DV issues that the increase in the number of DV consultations was not directly linked to the rise in divorce. For example, couples with children may be in a situation where they are forced to hold off on divorce even if they experience violence at home, resulting in a much longer time than our analysis period before divorce is finalized. We may also have to consider the role of Japan’s divorce system, which relies on principal agreements. Divorce in Japan is not mediated through courts (as in the US and many other countries); it is mainly a negotiated divorce within couples. While divorce without a third party has the advantage of simplifying the procedures for couples, it makes it harder for the spouse with an unfavorable position to negotiate over the conditions of compensation, custody, and payment for alimony and child support. Consequently, it becomes more challenging for them to step toward divorce and lengthen their time to procure it. Therefore, further insights utilizing long-term and microdata are necessary to determine the reasons for the decline in the number of divorces.

<sup>7</sup> The survey results are available at: [https://www.meijiyasuda.co.jp/profile/news/release/2020/pdf/20201116\\_01.pdf](https://www.meijiyasuda.co.jp/profile/news/release/2020/pdf/20201116_01.pdf).

## 6 Conclusion

Recently, several published reports have shown a decrease in the number of divorces and marriages during the early stages of the COVID-19 pandemic (Manning & Payne, 2021; Fallesen, 2021; Kim & Kim, 2021). Japan is no exception, but our study did not just examine the number of cases over time; it analyzed the effect of both nationwide and region-specific stay-at-home policies due to COVID-19 on family formation. Specifically, we conduct a DID analysis using monthly panel data on marriage and divorce registrations in prefectures to find that these policies matter for both numbers of marriages and divorces. According to our estimations, a nationwide state of emergency reduced the number of marriages per 1000 population by 10.4%, while that of divorces was reduced by 27.0%. Moreover, the prefectures designated the special-precautions area suffered additional reductions with 6.1% and 8.9% for those of marriage and divorce, respectively. The comparison of the coefficients also implies that divorce decisions are more sensitive than those for marriages, and the impact is greater in areas where strict policies are applied. These results, obtained after controlling for changes in the employment environment and removing trends in the number of divorces and marriages, provide information for evaluating the effects of behavioral restrictions on family formation during the first wave of the COVID-19 pandemic.

One policy concern is whether the decline in the number of marriages and divorces caused by the government's request for self-restraint was a temporary phenomenon. Figure 3 shows the quarterly trends in the number of marriages and divorces for the treatment and control groups, with the first quarter (January to March) of 2013 at 100. We extend the period of data used in our estimation (January 2013 to July 2020) to June 2021, for which data are available as of January 2022. Figure 3 shows that while the shocks continued until the third quarter of 2020, when the government had already lifted the policy, both the numbers of marriages and divorces appear to have returned to the pre-pandemic trends after the fourth quarter of 2020 in two aspects. First, the numbers themselves seem to return to a moderate downward trend that continued until a substantial decline in interest. Second, the speed of decreasing numbers between the treatment and control groups reversed in April and May 2020, followed by the control groups' re-overtaking aftermath. These two points suggest that the impact



**Fig. 3** Number of marriages and divorces (first quarter of 2013 = 100). **a** Marriages. **b** Divorces. *Note.* I shown on the horizontal axis refers to the first quarter from January to March, and II, III, and IV refer to the subsequent three months

of the government's emergency measures in April and May 2020 was generally temporary. However, as discussed in the previous subsection, no considerable spikes were found along with the government's policy cancellation. Given the broadly continued trend of declining marriages and divorces over the years, the number of couples counted in the temporal decline was removed from this figure. Even if the drops seem temporary, their recovery from the COVID-19 pandemic and its policy in whole meaning seem to take much more time.

In closing the paper, several limitations of our study should be mentioned. First, the stay-at-home policies in Japan are not strict lockdown policies, as seen in other countries. Although many Japanese citizens have followed the policy, it may not be a strict exogenous shock for individuals. Moreover, while we provide the first result on the relationship between the pandemic of COVID-19 and the decisions on marriage and divorce using fixed effect model analysis with panel dataset, we have still technical limitations to strictly approach its causal effects.

Second, the study remains confined to the effects on family formation in a short period of time (less than two years at most) after a pandemic. Decisions on family formation typically require individuals a long time to make, considering housing, intergenerational relations, their own working styles, and so on. The number of marriages and divorces may be pegged to a lower level even long after the outbreak, or there may be a backlash in them. If the decision to marry and divorce is postponed for a longer period, our dataset cannot capture it. Thus, it is a promising direction to investigate the long-run effects using a longer period of the dataset.

Finally, there is an issue of data quality. In our study, we used publicly available data on the number of marriages and divorces in each prefecture along with labor market-related information. Although these are based on reliable government statistics, they are aggregate data and do not accurately capture individual-level decision-making in the face of marriage and divorce choices. For example, whether a divorced couple owns or rents the house they live in, whether they have the support of their own parents, and whether they have children will play an important role in their decision to divorce. However, analyses using aggregated data cannot capture the impacts of these individual attributes. Our study aims to provide a timely analysis that captures the impact of the COVID-19 pandemic and corresponding government actions on family formation, albeit with a limited dataset. However, it will be possible to validate our results with a more detailed analysis once longer-term and micro data become available.

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#### **Compliance with ethical standards**

**Conflict of interest** The authors declare no competing interests.

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## References

- Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020). Inequality in the impact of the coronavirus shock: evidence from real time surveys. *Journal of Public Economics*, *189*, 104245.
- Alon, T. M., Doepke, M., Olmstead-Rumsey, J., & Tertilt, M. (2020). The impact of COVID-19 on gender equality. NBER Working Papers 26947.
- Amato, P. R., & Beattie, B. (2011). Does the unemployment rate affect the divorce rate? An analysis of state data 1960-2005. *Social Science Research*, *40*(3), 705–715.
- Ananat, E. O., Gassman-Pines, A., & Gibson-Davis, C. (2013). Community-wide job loss and teenage fertility: evidence from North Carolina. *Demography*, *50*(6), 2151–2171.
- Ariizumi, H., Hu, Y., & Schirle, T. (2015). Stand together or alone? Family structure and the business cycle in Canada. *Review of Economics of the Household*, *13*(1), 135–161.
- Armbruster, S., & Klotzbuher, V. (2020). Lost in lockdown? Covid-19, social distancing, and mental health in Germany. *COVID Economics*, *22*, 117–153.
- Baghestani, H., & Malcolm, M. (2014). Marriage, divorce and economic activity in the US: 1960–2008. *Applied Economics Letters*, *21*(8), 528–532.
- Becker, G. S. (1973). A theory of marriage: Part I. *Journal of Political Economy*, *81*(4), 813–846.
- Becker, G. S., Landes, E. M., & Michael, R. T. (1977). An economic analysis of marital instability. *Journal of Political Economy*, *85*(6), 1141–1187.
- Beland, L. P., Brodeur, A., Haddad, J., & Mikola, D. (2020). Covid-19, family stress and domestic violence: remote work, isolation and bargaining power. GLO Discussion Paper, No. 571.
- Bellido, H., & Marcen, M. (2019). Fertility and the business cycle: the European case. *Review of Economics of the Household*, *17*(4), 1289–1319.
- Brodeur, A., Clark, A., Fleche, S., & Powdthavee, N. (2021). Covid-19, lockdowns and well-being: evidence from google trends. *Journal of Public Economics*, *193*, 104346.
- Cabinet Office (2021). Changes in the number of cases of domestic violence (in Japanese), [https://www.gender.go.jp/policy/no\\_violence/pdf/soudan\\_kensu.pdf](https://www.gender.go.jp/policy/no_violence/pdf/soudan_kensu.pdf). Accessed 1 Aug 2021.
- Cherlin, A., Cumberworth, E., Morgan, S. P., & Wimer, C. (2013). The effects of the Great Recession on family structure and fertility. *The Annals of the American Academy of Political and Social Science*, *650*(1), 214–231.
- Cohan, C. L., & Cole, S. W. (2002). Life course transitions and natural disaster: marriage, birth, and divorce following Hurricane Hugo. *Journal of Family Psychology*, *16*(1), 14–25.
- Cohan, C. L., Cole, S. W., & Schoen, R. (2009). Divorce following the September 11 terrorist attacks. *Journal of Social and Personal Relationships*, *26*(4), 512–530.
- Fallesen, P. (2021). Decline in rate of divorce and separation filings in Denmark in 2020 compared with previous years. *Socius*, *7*, 23780231211009991.
- Fischer, T., & Liefbroer, A. C. (2006). For richer, for poorer: The impact of macroeconomic conditions on union dissolution rates in the Netherlands 1972-1996. *European Sociological Review*, *22*(5), 519–532.
- Gonzalez-Val, R., & Marcen, M. (2017). Divorce and the business cycle: a cross-country analysis. *Review of Economics of the Household*, *15*(3), 879–904.
- Gonzalez-Val, R., & Marcen, M. (2018). Unemployment, marriage and divorce. *Applied Economics*, *50*(13), 1495–1508.
- Halla, M., & Scharler, J. (2012). Marriage Divorce and Interstate Risk Sharing\*. *The Scandinavian Journal of Economics* *114*(1) 55–78.
- Hamermesh, D. S. (2020). Lock-downs, loneliness and life satisfaction. NBER Working Papers 27018.
- Heggeness, M. L. (2020). Estimating the immediate impact of the COVID-19 shock on parental attachment to the labor market and the double bind of mothers. *Review of Economics of the Household*, *18*(4), 1053–1078.
- Hellerstein, J. K., Morrill, M. S., & Zou, B. (2013). Business cycles and divorce: evidence from microdata. *Economics Letters*, *118*(1), 68–70.
- Jensen, P., & Smith, N. (1990). Unemployment and marital dissolution. *Journal of Population Economics*, *3*(3), 215–229.
- Kikuchi, H., Machida, M., Nakamura, I., Saito, R., Odagiri, Y., Kojima, T., Watanabe, H., Fukui, K., & Inoue, S. (2020b). Changes in psychological distress during the COVID-19 pandemic in Japan: a longitudinal study. *Journal of Epidemiology*, *30*(11), 522–528.
- Kikuchi, S., Kitao, S., & Mikoshiba, M. (2020a). Who suffers from the COVID-19 shocks? Labor market heterogeneity and welfare consequences in Japan. *Journal of the Japanese and International Economies*, *59*, 101117.

- Kim, J., & Kim, T. (2021). Family formation and dissolution during the COVID-19 pandemic: evidence from South Korea. *Global Economic Review*, 50(1), 1–19.
- Leslie, E., & Wilson, R. (2020). Sheltering in place and domestic violence: evidence from calls for service during COVID-19. *Journal of Public Economics*, 189, 104241.
- Mamelund, S. E. (2004). Can the Spanish influenza pandemic of 1918 explain the baby boom of 1920 in neutral Norway? *Population*, 59(2), 229–260.
- Manning, W. D., & Payne, K. K. (2021). Marriage and divorce decline during the COVID-19 pandemic: a case study of five States. *Socius*, 7, 23780231211006976.
- Mlambo-Ngcuka, P. (2020). Violence against women and girls: the shadow pandemic. Retrieved February 7, 2020, <https://www.unwomen.org/en/news/stories/2020/4/statement-ed-phumzile-violence-against-women-during-pandemic>. Accessed 1 Aug 2021.
- Naito, T., & Ogawa, H. (2021). COVID-19 self-restraint at home and pregnancy: evidence from Japan. *Applied Economics Letters* 1–4. <https://doi.org/10.1080/13504851.2021.1922584>.
- Rosenzweig, M. R., & Wolpin, K. I. (1985). Specific experience, household structure and intergenerational transfers: farm family land and labor arrangements in developing countries. *Quarterly Journal of Economics*, 100, 961–987.
- Rosenzweig, M. R., & Stark, O. (1989). Consumption smoothing, migration, and marriage: evidence from rural India. *Journal of Political Economy*, 97(4), 905–926.
- Schaller, J. (2013). For richer, if not for poorer? Marriage and divorce over the business cycle. *Journal of Population Economics*, 26(3), 1007–1033.
- Schneider, D. (2015). The great recession, fertility, and uncertainty: evidence from the United States. *Journal of Marriage and Family*, 77(5), 1144–1156.
- Schneider, D., & Hastings, O. P. (2015). Socioeconomic variation in the effect of economic conditions on marriage and nonmarital fertility in the United States: evidence from the Great Recession. *Demography*, 52(6), 1893–1915.
- Sevilla, A., & Smith, S. (2020). Baby steps: the gender division of childcare during the COVID19 pandemic. IZA DP No. 13302.
- Shore, S. H. (2010). For better, for worse: intrahousehold risk-sharing over the business cycle. *Review of Economics and Statistics*, 92(3), 536–548.
- Stevenson, B., & Wolfers, J. (2007). Marriage and divorce: changes and their driving forces. *Journal of Economic Perspectives*, 21(2), 27–52.
- Takaku, R., & Yokoyama, I. (2021). What the COVID-19 school closure left in its wake: evidence from a regression discontinuity analysis in Japan. *Journal of Public Economics*, 195, 104364.
- Taub, A. (2020). A new Covid-19 crisis: domestic abuse rises worldwide. The New York Times, April 6, 2020.
- Usher, K., Bhullar, N., Durkin, J., Gyamfi, N., & Jackson, D. (2020). Family violence and COVID-19: Increased vulnerability and reduced options for support. *International Journal of Mental Health Nursing*, 29(4), 549–552.
- Wagner, B. G., Choi, K. H., & Cohen, P. N. (2020). Decline in marriage associated with the COVID-19 pandemic in the United States. *Socius*, 6, 2378023120980328.
- WHO (2020). COVID-19 and violence against women: what the health sector/system can do. <https://apps.who.int/iris/bitstream/handle/10665/331699/WHO-SRH-20.04-eng.pdf>. Accessed 1 Aug 2021.
- World Bank (2020). The global economic outlook during the COVID-19 Pandemic: a changed world. <https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world>. Accessed 18 Jan 2021.
- Yabe, T., Tsubouchi, K., Fujiwara, N., Wada, T., Sekimoto, Y., & Ukkusuri, S. V. (2020). Non-compulsory measures sufficiently reduced human mobility in Tokyo during the COVID-19 epidemic. *Scientific Reports*, 10(1), 18053.
- Yamamura, E., & Tsutsui, Y. (2021a). The impact of closing schools on working from home during the COVID-19 pandemic: evidence using panel data from Japan. *Review of Economics of the Household*, 19(1), 41–60.
- Yamamura, E., & Tsutsui, Y. (2021b). School closures and mental health during the COVID-19 pandemic in Japan. *Journal of Population Economics*, 34, 1261–1298.
- Yamamura, E., & Tsutsui, Y. (2022). How does the impact of the COVID-19 state of emergency change? An analysis of preventive behaviors and mental health using panel data in Japan. *Journal of the Japanese and International Economies* 64, 101194. <https://doi.org/10.1016/j.jjie.2022.101194>.