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Divorce and Loss of Marital Gains from the Division of Labor: Evidence from a Pension Reform in Japan*

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Abstract

We examine the impact of Japan's 2007 pension reform on divorce decisions. Prior to the reform, many Japanese couples maintained a traditional division of labor into old age, where the primary earner continued to receive income through employment-related pensions, while the spouse contributed through household work. The reform allowed spouses to claim half of the primary earner's pension contributions accrued during marriage in the event of divorce, enabling them to capture the economic gains of the traditional division of labor without remaining married. Using the reform as a natural experiment, we test the hypothesis that the reduction in these marital gains increased the likelihood of divorce. Our analysis reveals that among couples experiencing the largest reduction in marital gains, the incidence of divorce rose by 10 to 20% in the year of the reform and the following three years. This finding highlights the important role of marital gains associated with the division of labor in shaping divorce decisions.

Keywords: divorce, marital gains, pension reform, marital property division.

JEL classification: D13; H31; J12; K36

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1 Introduction

In recent decades, marriage rates in Japan have steadily declined, raising questions about the underlying causes. One explanation is a reduction in the economic gains from marriage, particularly those derived from its function as a cooperative economic unit (Becker, 1991; Browning *et al.*, 2014).[1] Among these gains, the traditional division of labor has been significantly eroded by social and economic changes. With women attaining higher levels of education and participating more actively in the labor market, the traditional economic advantages associated with the division of labor may have diminished.[2] However, establishing a causal link between these changing marital gains and marriage decisions is challenging, as randomly assigning couples to different levels of spousal labor specialization is both impractical and unethical.

The Japanese public pension reform of April 2007 provides an ideal natural experiment for studying the marital gains arising from the division of labor. Typical couples most affected by this reform were those in which primary earners (typically husbands) specialized in market labor, while dependent spouses (typically wives) specialized in unpaid care and household work (hereafter collectively referred to as "household work"). Primary earners working as salaried employees contributed to the pension system and later received part of their labor compensation as pension benefits. Therefore, even after retirement, those couples continued to enjoy the gains from the division of labor, with primary earners providing financial resources through pension

[1]The economic gains from marriage include the division of labor, the sharing of household public goods, and risk sharing between spouses. For detailed discussions, see, for example, Korenman and Neumark (1992), and Chichilnisky (2008) regarding the division of labor, Lazear and Michael (1988) and Browning *et al.* (2013) on the sharing of household public goods, and Kotlikoff and Spivak (1981), Rosenzweig and Stark (1989), and Hess (2004) on risk sharing between spouses.

[2]As one would expect, while the decision to marry depends on the economic gains from the division of labor, it is also strongly influenced by preferences for having children. In Western countries with extensive childrearing support, even highly educated women—who may experience smaller gains from specialization—are often able to marry and raise children more easily, helping to mitigate the decline in marriage rates. In contrast, Japan has historically provided limited institutional support for parenting (though this has gradually improved in recent years), making marriage and childrearing more challenging. As a result, economic gains from the division of labor have likely played a stronger role in shaping marriage decisions in Japan.

benefits and dependent spouses contributing through household work.

However, the 2007 pension reform disrupted this post-retirement division of labor by allowing dependent spouses to claim 50% of the pension entitlements upon divorce, calculated based on the contributions made by the primary earner during the marriage, including those made prior to April 2007. This reform resulted in the loss of marital gains from the division of labor, as dependent spouses no longer needed to remain married to access their share of pension benefits. In other words, it provided them with financial security in old age—a gain that had previously been attainable only through marriage—even after divorce. As a result, divorce became a more viable option for dependent spouses.

Focusing on Japan as the subject of analysis offers several advantages in estimating the impact of the loss of marital gains from the division of labor on divorce. First, gender role norms have been deeply ingrained in Japan, and the traditional division of labor remained prevalent, particularly among middle-aged to older couples at the time of the pension reform.[3] Second, the Japanese pension system has three key features that facilitate identification of the reform's impact: (i) mandatory enrollment, (ii) the prominence of public pensions as the principal (and often sole) source of income after primary earner's retirement, and (iii) the provision of lifetime annuities. The first feature eliminates concerns about endogeneity regarding whether couples enroll in the public pension system—that is, whether they were affected by the 2007 pension reform—as enrollment is not a matter of individual discretion. The second and third features imply that the reform was likely to significantly influence the divorce decisions of dependent spouses, as they were often unable to earn sufficient income after divorce and thus relied heavily on public pensions to support themselves in old age. Finally, in Japan, divorce requires the mutual consent of both spouses. This conferred significant control over the timing of divorce to dependent spouses, who stood to benefit from

[3]While the prevalence of traditional gender roles has declined in many countries, such norms persist in Japan, where women continue to bear the majority of childcare, informal caregiving, and household responsibilities (IMF, 2024).

divorcing after April 2007. Even if a primary earner wanted to expedite a divorce before March 2007 to avoid having to transfer up to half of their pension entitlements to their spouse, they would not have been able to do so without the dependent spouse's consent. This institutional setting allows a precise identification of the post-reform increase in divorces.[4]

Estimating the impact of institutional changes on divorce decisions is a topic that has received considerable attention in the literature; however, identifying the underlying mechanisms remains a challenge. Several studies have investigated the effects of the shift from fault-based to unilateral divorce laws (UDLs) on divorce rates. Evidence from Europe suggests that this change contributed to a rise in divorce rates (González and Viitanen, 2009), while studies on the United States indicate that the effects may have been temporary (Wolfers, 2006). In addition to reducing the costs of divorce by removing the requirement to prove fault in court, the introduction of UDLs was also associated with behavioral changes that potentially diminished marital gains—most notably, increases in female labor supply and declines in marriage-specific investments (Angelini *et al.*, 2019; González and Özcan, 2013; Pericoli and Ventura, 2012; Roff, 2017; Stevenson, 2007; Voena, 2015). Because these two factors—lower divorce costs and shifts in spousal behavior—occurred simultaneously, it is difficult to isolate the specific mechanism responsible for the observed rise in divorce rates.

The Japanese pension reform provides a valuable opportunity to disentangle these mechanisms and isolate the effect of diminished marital gains. This is because, unlike UDL reforms, the Japanese reform affected a group—wives typically around the age of 60—for whom both labor supply and marriage-specific investments remained largely unchanged even after the reform took effect. Consequently, the observed increase in divorces can be more confidently attributed to the reduction in marital gains, rather than to concurrent changes in behavior.

[4]In this study, the term "divorce" refers specifically to the dissolution of a legally registered marriage. Given that Japan does not recognize partnership systems—except in limited cases at the municipal level—and de facto marriages are exceedingly rare, it is appropriate to restrict our analysis to legally registered marriages and their dissolutions.

Another strand of literature focuses on how income shocks influence marital outcomes. Researchers have examined these dynamics in the context of lottery winnings (Boertien, 2012; Bulman *et al.*, 2022; Cesarini *et al.*, 2023; Golosov *et al.*, 2024; Hankins and Hoekstra, 2011), policy–induced income shocks – including changes in public transfers and marital property laws (Amilon, 2015; Berniell *et al.*, 2020; Bitler *et al.*, 2004; Bobonis, 2011; Hoffman and Duncan, 1995; Tjøtta and Vaage, 2008) – and natural disasters (Deryugina *et al.*, 2018; Kureishi *et al.*, 2025). Such shocks affect divorce through two distinct mechanisms: (i) changes in couples' income during marriage, and (ii) disproportionate changes in income between spouses following divorce, for example, when the wife experiences a greater increase in income than the husband. As with the institutional changes discussed earlier, it is often difficult to disentangle these mechanisms and identify which one drives changes in divorce behavior.[5] However, the pension reform analyzed in this study allows us to isolate mechanism (ii), as up to half of the pension entitlements based on the contributions made by the primary earner during the marriage—i.e., a marital gain previously accessible only by remaining married—came to be transferred to the spouse upon divorce, keeping the total amount of pension benefits received by the couple unchanged.[6] Given that many older women in Japan at the time of the reform had spent most of their adult

[5]Prior studies typically either estimate the combined effect of (i) and (ii), or focus solely on (i), and it is often unclear which mechanism is actually being identified. For example, studies estimating the impact of lottery winnings on divorce illustrate this point. If lottery winnings are not equally divided between spouses upon divorce (i.e., the winner retains a larger share), the estimated effect likely reflects the combined influence of mechanisms (i) and (ii). In contrast, if the winnings are split equally, then only mechanism (i) is likely to be at play. Cesarini *et al.* (2023), studying lottery winners in Sweden, note that although Swedish marital law requires equal division of all assets upon divorce, deviations from this rule are frequently observed. Therefore, in many couples examined in their study, both mechanisms likely operated simultaneously, whereas among couples that strictly adhered to equal division, only mechanism (i) would have been at work.

[6]The only comparable study is Amilon (2015), which analyzes the effect of a reform in Denmark that shifted pension savings from community to private property upon divorce. Our analysis differs from hers in several respects. First and most importantly, Amilon does not conduct a theoretical analysis that focuses on the division of labor as a factor influencing divorce decisions, nor does she interpret her results from that perspective. Second, the size of pension transfers is substantially larger in our setting, with dependent spouses receiving approximately JPY 9.6 million (USD 80,000) on average (see Section 2.3 for further details). Based on figures reported in Amilon's study, we estimate that the Danish reform involved pension transfers amounting to only about 5%—at most 23%—of the sums transferred under the Japanese pension reform.

lives as full-time homemakers, an observed increase in divorces among middle-aged and older couples could be attributed to the loss of gains from the division of labor for the dependent spouse.

We analyze the effects of the pension reform on divorce both empirically and theoretically. First, our theoretical model demonstrates that in households where the husband is the primary earner and the wife is a homemaker, wives whose husbands have made larger pension contributions during marriage—and therefore receive greater pension entitlements through division upon divorce—would achieve higher utility by divorcing than by remaining married after the 2007 pension reform.

Next, we empirically test the prediction of our theoretical model using a difference-in-differences (DID) framework. The reform generated substantial variation in its impact across couples, depending on factors such as marriage length, since the amount of pension contributions subject to division increases with the duration of marriage, whether the primary earner was employed by a large or small to medium-sized firm (used as a proxy for the amount of pension contributions subject to division, which reflects differences in earnings), and whether the primary earner was covered by the pension scheme affected by the reform.

Among the factors that potentially mediate the reform's impact, we first focus on marriage length. The divorce response to the reform was most pronounced among couples with longer marriages. For couples married the longest (25 to 29 years) in our sample, we find that the incidence of divorce—calculated as the number of divorces divided by the number of couples remaining married—increased by approximately 10% in fiscal year 2007 (FY), the year when the pension division rule upon divorce took effect, compared to couples married for less than 5 years. This elevated divorce incidence persisted in subsequent years and even increased further, reaching approximately 20% two to three years after the reform. Significant increases in the divorce incidence were also observed among couples married for 20 to 24 years and for 15 to 19 years, although the magnitude of the increase was smaller than for couples married for 25 to 29 years.

One potential confounding factor is the presence of minor children. Couples with young children may be less likely to divorce even after the reform due to concerns about the potential negative impact on their children. In contrast, longer-married couples are less likely to have minor children, which may partly explain their stronger divorce response, independent of the pension reform's impact. To address this, we estimate the effect of the reform separately for couples with and without minor children. The results indicate that the increase in divorces was more pronounced for longer-married couples, regardless of whether they had minor children. This suggests that the difference in the increase in divorce incidence reflects not only child-related constraints but also the magnitude of the impact of the new pension division rule, which was likely to be greater for older couples, among whom the primary earner had accumulated more years of pension contributions.

We also examine how the effect of the pension reform on divorce varies depending on the primary earner's firm size and occupational status. Among couples married for 20 to 24 years and 25 to 29 years, those in which the primary earner was employed by a large firm were more likely to divorce following the reform than those in which the primary earner worked for a small to medium-sized firm. Furthermore, we find no significant increase in divorce incidence among couples whose primary earner was self-employed or engaged in farming—occupations for which pension contributions are not subject to division upon divorce.

These findings, which support our theoretical hypothesis, are unlikely to be driven by couples who would have divorced regardless of the reform but merely delayed their divorce to benefit from the new rule. While the reform took effect in April 2007, it was announced in June 2004, creating incentives for dependent spouses to delay divorce until April 2007. Our analysis does reveal some evidence of such postponement behavior; however, the increase in divorces attributable to this factor is marginal. Thus, our findings suggest that the observed increase in divorces was primarily driven by dependent spouses who would not have chosen divorce in the absence of the pension reform but did so because the reform provided them with greater financial security

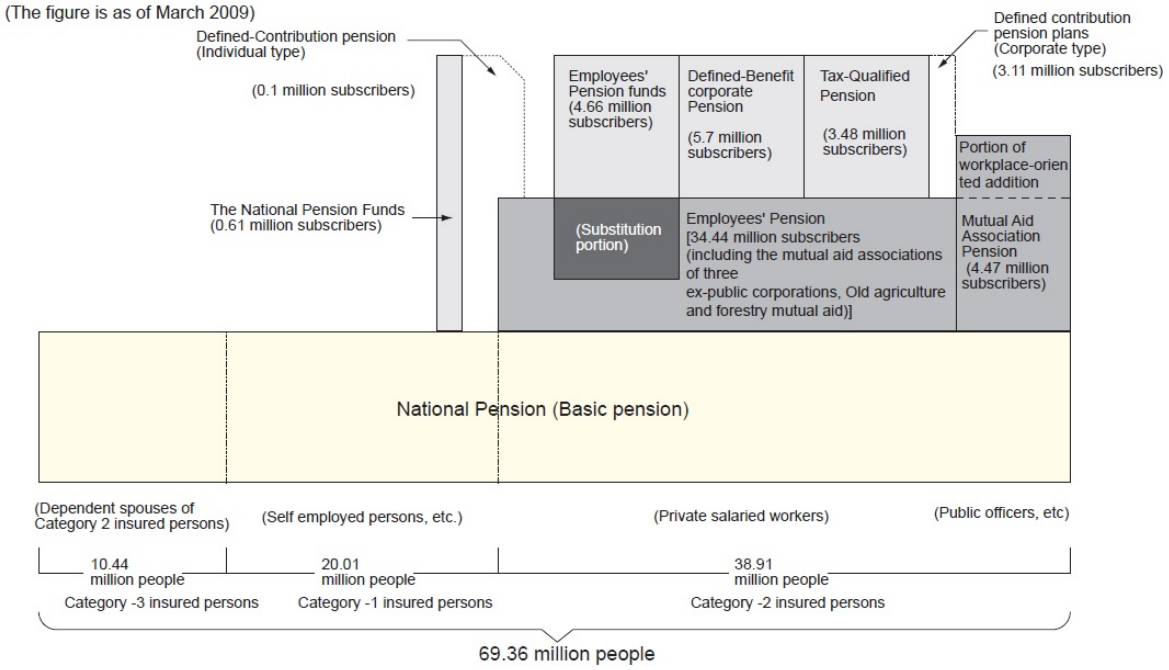
after divorce.

This study contributes to four key areas of the literature. First, it advances understanding of the factors underlying declining marriage rates by highlighting one aspect of marital gains. Second, it examines how changes in the division of marital property impact divorce decisions. This contrasts with previous studies, most of which focus on the effects of such changes on spousal bargaining power during marriage and their influence on leisure, expenditures, and the provision of household public goods (Dong, 2022; Huang *et al.*, 2023; Sakamoto, 2008; Toriyabe, 2025; Wang, 2014). Third, it contributes to understanding whether and how economic incentives influence marital decisions. While prior studies on this topic exist for the United States (Dillender, 2016; Heim, 2003; Nixon, 1997; Peters, 1993) and Scandinavian countries (Amilon, 2015; Tjøtta and Vaage, 2008), research on other countries is limited (notable exceptions include Berniell *et al.* (2020) on Argentina and Bobonis (2011) on Mexico).[7] Finally, in addition to these empirical contributions, this study also contributes to theoretical research by developing a model that incorporates the gains from the division of labor and divorce decisions.

The remainder of this study is organized as follows. Section 2 provides the institutional background, including an overview of the Japanese public pension system and the framework for pension division upon divorce before and after the 2007 reform. Section 3 develops a theoretical model to explain how the pension reform influenced divorce decisions. Section 4 describes the data used in our analysis, while Section 5 outlines the empirical methodologies. Section 6 presents the estimation results. Finally, Section 7 concludes.

[7]Understanding how individuals respond to economic incentives related to divorce and marriage is critical for preventing policy reforms that may lead to unintended consequences. For example, Japan's 2007 pension reform may have distorted the decisions of high-income earners—who were particularly affected by the new pension division rule upon divorce—regarding whether and when to marry.

Figure 1: The Japanese public pension system



Source: The figure is taken from the Ministry of Health, Labour and Welfare (MHLW), *Pension Security in Japan*.

2 Institutional background

2.1 Japanese pension system

This section outlines the basic structure of Japan's public pension system. The system comprises two tiers: the National Pension (Tier 1), which covers all insured individuals, and the Employees' Pension (Tier 2), which is available only to Category-2 insured persons. The cream-colored and dark gray areas in Figure 1 represent Tier 1 and Tier 2, respectively. In addition to the public pension system, there is also a private pension component (Tier 3), for which contributions are made separately and which provides supplemental benefits on top of the public pension (represented by the light gray area in Figure 1).

Insured persons under the public pension system are classified into three categories: Category-1, Category-2, and Category-3. Category-2 insured persons are salaried em-

ployees under the age of 70—including national and local government employees as well as private school teachers—and receive benefits from both the National Pension and the Employees' Pension. Category-3 insured persons are dependent spouses (earning less than JPY 1.3 million annually, or approximately USD 10,800 at the 2007 exchange rate of 120 yen to the dollar) of Category-2 insured persons who are between 20 and 59 years old. All other individuals, such as farmers, self-employed individuals, students, employees not covered by the Employees' Pension, and the unemployed, fall into Category-1.

Next, we provide more details on the three features of the Japanese public pension system mentioned in Section 1, namely: (i) mandatory enrollment, (ii) public pensions as the main (and often sole) source of income after the primary earner's retirement, and (iii) the provision of lifetime annuities. Regarding (i), all individuals aged 20 to 59 who are registered residents of Japan, regardless of nationality, are legally required to contribute to the Japanese public pension system. With respect to (ii), not all individuals in Japan participate in private pensions (Tier 3), and even when they do, the pension amounts are typically not large.[8] Finally, concerning (iii), because Japan's public pension system operates on a pay-as-you-go basis, it offers pensions that are at least partially indexed to inflation and are generally paid out for the lifetime of the beneficiary.

2.2 Pension division upon divorce

This subsection briefly describes the treatment of pensions in marital property division before and after the pension reform enacted in April 2007.

[8] According to Figure 1, as of 2009, the total number of Tier 3 participants was less than half of the number of Category-2 insured persons, indicating that private pensions cover only a minority of the working population. This highlights the limited role of private pensions and reinforces the fact that public pensions remain the primary source of income after retirement for most people in Japan.

Before the pension reform

Before the pension reform, public pension benefits were rarely considered in the property division upon divorce. As a result, divorced women—particularly those who had been full-time homemakers during their marriage—often received only a small amount of benefits (i.e., the National Pension in Figure 1) in old age. In cases where divorce occurred after the primary earner had begun receiving pension benefits, it was sometimes arranged that the dependent spouse would receive a portion of those monthly benefits on an ongoing basis.[9] However, even in such cases, the dependent spouse could lose access to the pension if the primary earner died. Since the primary earner was typically male, often older than the dependent spouse, and likely to have a shorter lifespan, this arrangement posed a significant financial risk for the dependent spouse. Furthermore, there was always the possibility that the primary earner might fail to make agreed-upon monthly payments. To make matters worse, if the primary earner had no assets other than their pension, legal provisions prohibiting the garnishment of pensions made enforcing such payments impossible. Additionally, litigation costs associated with including pensions in marital property division were often prohibitive for full-time homemakers, making it financially unfeasible to pursue such claims. The situation was even worse for divorces occurring before the primary earner began receiving pension benefits. It was uncommon to include pensions in the property division due to the difficulty of accurately determining the value of future pension benefits at the time of divorce.

To address these issues and enable dependent spouses to divorce without undue concern about their financial security in old age, the 2007 pension reform introduced a new rule granting dependent spouses the right to receive half of the primary earner's pension benefits accrued during the marriage. The legislation establishing this pension

[9] According to Nakamura (2003), one of the most knowledgeable lawyers on marital property division in Japan, judicial precedents permitted the inclusion of pension benefits already being received by the primary earner in the property division, despite the absence of an explicit provision in the Civil Code. However, because this was not established as a legal right for the dependent spouse, it is believed that few dependent spouses actually received a share of the primary earner's pension.

division rule was passed in June 2004 and took effect in April 2007. The new rule applies to all couples who divorced subsequently.

After the pension reform

The new pension division rule applies to the Employees' Pension (Tier 2) of Category-2 insured persons. For couples who divorced after April 2007, dependent spouses became legally entitled to receive up to 50% of the Employees' Pension benefits accrued from the combined contributions of both spouses during the marriage. However, this rule does not automatically grant dependent spouses a 50% share of the couple's total pension benefits linked to their period of marriage. Nevertheless, during our sample period, 92–95% of divorced couples who utilized this rule opted for an equal division, meaning that former wives received 50% of the pension benefits (see Subsection 2.3 for details). Importantly, this applies not only to pension contributions paid after April 2007 but also to those paid during the marriage before that date.

The proportion of pension benefits transferred from the primary earner to the dependent spouse depends on the labor earnings of each spouse over the course of their marriage. If the dependent spouse was a full-time homemaker with no labor earnings, they receive half of the Employees' Pension entitlements from the primary earner. When both spouses are Category-2 insured persons, the proportion of pension benefits transferred reflects the ratio of their respective labor earnings during the marriage. For example, if the husband earned a cumulative total of JPY 90 million and the wife earned a cumulative total of JPY 10 million during their marriage, their combined earnings would be JPY 100 million. In this case, before the pension reform, the wife typically received only 10% (=JPY 10 million/JPY 100 million) of the total pension benefits associated with their marriage period. However, after the reform, she became entitled to receive 50%.

This reform allowed the government to transfer pension benefits directly to the dependent spouse without involving the primary earner, thereby significantly reducing

the dependent spouse's burden of negotiating pension division. Strictly speaking, the primary earner's consent is required to divide pension benefits upon divorce even after the reform. However, in practice, the primary earner typically agrees to the division, since refusal would almost inevitably result in a court case, where pension division would ultimately be enforced.

Apart from the pension division rule introduced in April 2007, another distinct provision known as the Category-3 pension division also came into effect in April 2008. This division rule allows Category-3 insured persons to receive half of the pension entitlement associated with the Employees' Pension contributions made by their spouse (i.e., the Category-2 insured person) during the marriage without requiring the spouse's consent. However, since this rule only applies to contributions paid after April 2008, its impact on divorce decisions is likely to have been minimal compared to the 2007 pension reform. In fact, the share of divorces that relied solely on the Category-3 pension division (i.e., divorces not using the division rule introduced in 2007) accounted for only 0.25% in FY2008, 1.03% in FY2009, and 2.10% in FY2010 of the total number of divorces in which couples divided their pension following either rule.

2.3 Awareness and utilization of the pension division rule

This section examines public awareness of the new pension division rule introduced in April 2007, the proportion of divorced couples who divided their pension property according to the rule, and how pension benefits were divided between spouses.

Awareness of the 2007 pension division rule

The Japanese Panel Survey of Consumers (JPSC), conducted by the Panel Data Research Center (PDRC) at Keio University, included a question in its October 2007 survey on whether respondents were aware of the pension division rule upon divorce. All respondents to this survey were women, and they were asked to select from four

options: "1. Know very well," "2. Know," "3. Slightly know," and "4. Do not know at all." Of the 1,211 married women who answered this question, 52.2% selected either option 1 or 2. Thus, more than half of married women were aware of the pension division rule upon divorce shortly after its introduction.

Women considering divorce—such as those dissatisfied with their marital relationship—or those likely to benefit more from the pension division rule, such as women in longer marriages, may have been more interested in the rule. To explore this, Appendix Figure A1 shows the proportion of respondents aware of the new rule, categorized by marital satisfaction and length of marriage, as separately assessed in the same survey. The results indicate that awareness of the pension division rule was higher among women with lower marital satisfaction. Specifically, nearly 60% of women reporting the lowest satisfaction were aware of the rule. Although awareness does not rise uniformly with the length of marriage, it is highest among respondents married for 20 years or more. This pattern likely reflects the fact that dependent spouses in longer marriages stand to benefit more, as the amount of Employees' Pension entitlements eligible for division increases with marital duration. These findings suggest that many women were aware of the pension division rule.

Proportion of divorced couples utilizing the pension division rule

The Overview of Social Insurance Services for the period from FY2007 to FY2010, published by the Social Insurance Agency, provides data on the number of divorced couples who divided their pension contributions under the new division rule, categorized by length of marriage. To calculate the proportion of such couples, we divide the number of these couples, categorized by marriage duration, by the corresponding number of divorces reported in the Vital Statistics on Divorces for FY2007 to FY2010, a dataset compiled by the Ministry of Health, Labour and Welfare (see Subsection 4.1 for details). For the denominator, we include only divorces in which the primary earner was employed by a firm at the time of divorce—that is, a Category-2 insured person

under the Employees' Pension scheme. This is because couples are eligible to use the new pension division rule as long as one of the spouses was a Category-2 insured person at any point during the marriage.[10]

Appendix Figure A2 reveals two key findings regarding the proportion of divorced couples dividing their pension. First, utilization of the pension division rule increased with marriage length, indicating that spouses in longer marriages were more likely to take advantage of the rule, consistent with the interpretation of Appendix Figure A1. Second, the proportion of couples utilizing the rule was higher in FY2008 and later than in FY2007. This aligns with the increase in the number of cases using the rule, from 8,634 in FY2007 to 18,282 in FY2010. These results suggest that awareness of the rule and understanding of its advantages for dependent spouses gradually increased after FY2007.

How pension benefits were divided between spouses

We examine how pensions were divided between spouses upon divorce. We begin by considering the direction of transfers—that is, whether pension benefits were transferred from husbands to wives or vice versa. According to the Overview of Cases on Pension Division upon Divorce, compiled by the Family Bureau of the Supreme Court General Secretariat, during the period from April to December 2007, 97.7% of divorces using the pension division rule filed in family courts involved benefits being transferred from husbands to wives. Specifically, of the 3,003 divorces in which family courts determined the proportion of pension benefits the dependent spouse was entitled to receive from the other, 2,933 cases (97.7%) involved transfers from husbands to wives, while only 70 cases (2.3%) involved transfers in the opposite direction.

Next, Appendix Table A1, based on the Overview of Social Insurance Services,

[10]Some couples in which the primary earner had already retired at the time of divorce may have been eligible to use the division rule, if the primary earner had been a Category-2 insured person before retirement. However, because the Vital Statistics only report the occupation at the time of divorce, we cannot identify such cases. As a result, while such retired couples may be included in the numerator, they are likely excluded from the denominator, which may lead to a slight overestimation of the proportion using the pension division rule.

shows how the total pension entitlements of divorced couples were divided between spouses. Across all years, 92% or more of couples divided their pension entitlements equally. In addition, in approximately 97% of cases, the dependent spouse received more than 40% of the couple's total entitlements. Combined with the fact that most transfers were from husbands to wives, this suggests that, for most couples using the pension division rule, a traditional division of labor prevailed, with the husband as the primary earner and the wife as a full-time homemaker.

Finally, we examine the monetary value of pension benefits transferred from the primary earner to the dependent spouse. According to the Overview of Social Insurance Services for FY2007, approximately JPY 40,000 (USD 333) per month was transferred from the primary earner to the dependent spouse among couples where both spouses had reached pensionable age and divided their pensions according to the new division rule. As a result, the dependent spouse's monthly pension nearly doubled, rising from approximately JPY 42,000 to JPY 82,000. Over a 20-year period starting at age 65, this monthly increase of JPY 40,000 would amount to a total of JPY 9.6 million (USD 80,000). According to the 2009 National Survey of Family Income and Expenditure, conducted by the Ministry of Internal Affairs and Communications, this amount corresponds to about 60 percent of the average financial assets held by single women aged 65 and older at that time (approximately JPY 16 million).[11] This significant transfer of pension entitlements likely alleviated financial insecurity in old age for dependent spouses, making it easier for them to proceed with divorce.

[11]While the pension division significantly improved the financial security of dependent spouses after divorce, it did not necessarily cover all post-divorce living expenses on its own. Any remaining gap could be financed through other means, such as property division (excluding pension division), post-divorce work, and inheritances or *inter vivos* gifts from parents. Thus, although the pension division likely played a major role in helping dependent spouses pursue divorce, it was not their only source of financial support.

2.4 Consent requirements for divorce

Japan employs a mutual consent regime for divorce, under which both spouses must agree to dissolve the marriage. In practice, however, when one spouse withholds consent, the other can pursue divorce through family court mediation. Japanese courts often grant divorce after three to five years of separation, even without the need to prove fault, such as infidelity or abuse. Therefore, while the Japanese system formally requires mutual consent, it provides a relatively high degree of freedom to divorce in practice—greater than that under the fault-based divorce systems that were historically adopted in many Western countries, but more limited than under unilateral divorce laws that allow one-sided dissolution of marriage.

As noted in Section 1, under the mutual consent system, even if the primary earner wished to expedite a divorce in or before March 2007 to avoid pension division, the dependent spouse could refuse to consent—particularly in cases where both spouses fully understood the implications of the reform. In light of these dynamics, this study focuses on the persistent post-reform increase in divorce and draws on the theoretical model presented in Section 3 to elucidate the underlying mechanisms.

Alternatively, the opposite scenario is also possible under this regime: even if the dependent spouse initiated a divorce after April 2007, the primary earner could refuse to consent. If this were widespread, divorces might not have increased immediately following the introduction of the new pension division rule. Typically, there are two main reasons why primary earners may initially withhold consent: (i) concerns about the negative effects of divorce on young children, and (ii) reluctance to lose the household work provided by their spouse. However, among couples that have been married for a long time—the group most affected by the reform—the proportion of those with young children is very low, rendering the first concern largely irrelevant. Regarding the second concern, even if the primary earner resists divorce, once the dependent spouse initiates the request, the couple often enters a period of separation. During this time, the primary earner can no longer benefit from their spouse's household work. More-

over, since courts in Japan often grant a divorce petition from the dependent spouse after a separation period of three to five years, agreeing to a divorce earlier may actually be more advantageous for the primary earner. Early agreement allows them to avoid having pension contributions accrued during the separation period become subject to division and eliminates the obligation to provide spousal maintenance during that period. For these reasons, many primary earners may determine that promptly consenting to divorce is in their best interest.

In fact, according to the Vital Statistics on Divorces, among couples in which the primary earner was a company employee and the marriage lasted 20 years or more, and who divorced between FY2007 and FY2010, 47.4% had no separation period (i.e., the month of divorce registration was the same as the month in which separation began). An additional 24.7% had a separation period of one year or less. These findings are consistent with the view that primary earners tended to consent relatively quickly to divorce requests from their spouses.

3 Theoretical analysis

3.1 Scope of the analysis

In the theoretical analysis, we focus on couples where the primary earner is approaching, but has not yet reached, retirement age. The reasons are as follows. First, the empirical analysis in this study identifies couples most affected by the introduction of the pension division rule (treatment group) based on whether the primary earner was employed by a (large) firm at the time of divorce. From the dependent spouse's perspective, divorcing after the primary earner's retirement would maximize the benefits from the pension division, as the primary earner's pension contributions would have reached their peak. However, even if the primary earner has not yet retired, the benefits of utilizing the division rule for the dependent spouse remain sufficiently high. Second, as explained in Section 2, the impact of the rule is greater for longer-married

couples. Therefore, it is appropriate to focus on middle-aged and older couples as the primary subjects for analyzing the rule's impact on divorce decisions, rather than younger couples.

Japanese couples with a primary earner approaching retirement around 2007 exhibited two key characteristics: (i) the husband was typically the primary earner, while the wife was a full-time homemaker (or, even if employed, worked part-time); and (ii) the husband generally held greater bargaining power than the wife.

Regarding (i), although women's labor force participation in Japan has been rising over the long term, as of 2007 it was still uncommon for wives in middle-aged and older couples to remain in full-time employment until retirement age. To illustrate this pattern quantitatively, we again draw on the JPSC, a panel dataset collected since 1993 that provides income data for both spouses. Since the 2007 pension reform applied only to the Employees' Pension, which covers company employees but not farmers or self-employed workers, we focus on couples who, as of 2006, had at least one salaried worker (i.e., not a farmer or self-employed worker) and for whom income from farming or self-employment accounted for less than 50% of the couple's total labor income. For these couples, we calculate the husband's share of cumulative labor income, measured as the share of the husband's cumulative labor income in the couple's cumulative labor income earned during marriage prior to the reform.[12] The results, presented in Figure 2(a), show that for the large majority of couples the husband's income share exceeds 0.5, with a particularly strong clustering close to 1. The mean share is 0.825, the median is 0.885, and the 25th percentile is 0.697. This implies that in more than half of households, the husband earned at least roughly 90% of the couple's cumulative labor income, and in 75% of households, the husband earned around 70% or more.

To complement this evidence on market labor specialization, we conduct a parallel

[12]Since the JPSC began in 1993, the husband's income share is calculated over the period from 1993 to 2006 at most. For respondents who got married after 1993, we calculate the husband's income share based on the years since they got married.

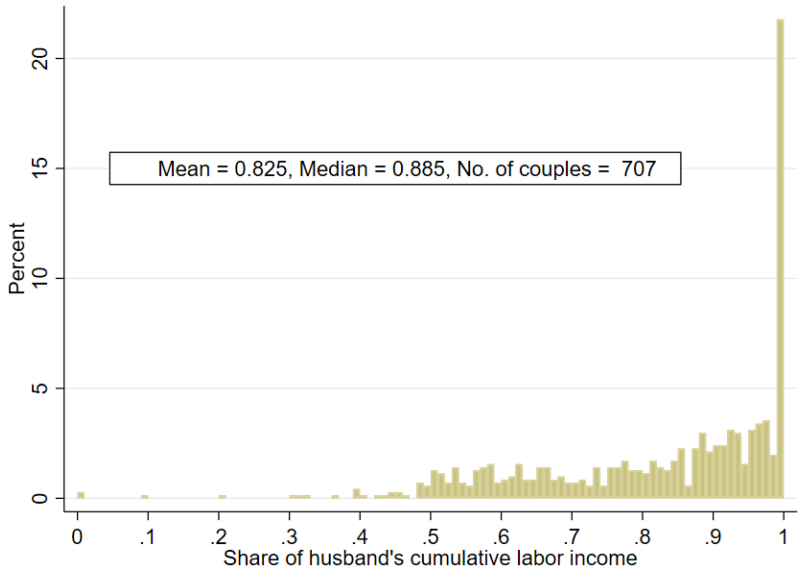
analysis based on the same dataset, examining whether wives perform most household work while husbands earn most of the income. Figure 2(b) presents the distribution of the husband's share of cumulative household work time, defined as the share of the husband's total hours of household work during marriage to the couple's combined total. The average share is just about 10 percent, and there is a clear concentration near zero, indicating that in many households, wives specialized in household work.

Since the JPSC sample includes only relatively young couples (those in their 40s or younger) and does not directly capture older, long-married couples who were likely to be most strongly affected by the reform, we complement this dataset with data from the 2005 Population Census of Japan, conducted by the Ministry of Internal Affairs and Communications. According to this census, among couples with husbands aged 55–59 who were "primarily working," 64% had wives whose labor force status was either "engaged in household work in addition to work" or "not in the labor force." Taken together, these two datasets suggest that, as of around 2007, the traditional division of labor between spouses prevailed in both younger and older cohorts. Building on this evidence regarding (i), it is reasonable to assume that husbands generally had higher incomes than their wives, and as a result, enjoyed stronger bargaining power within the marriage.

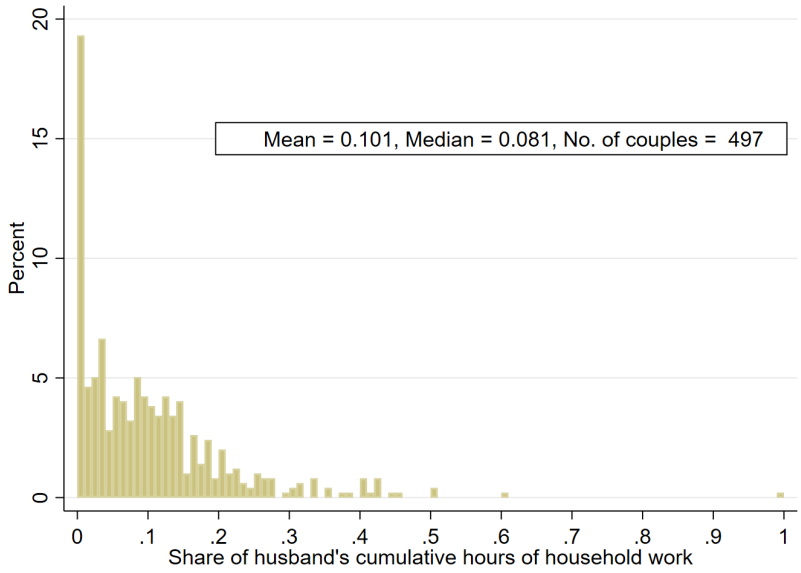
In our model below, prior to the husband's retirement, a typical Japanese couple maximizes the weighted sum of their utilities within the division of labor in which the husband participates in the external labor market while the wife performs household work. Our model further shows that, for such couples, without pension division, the division of labor would likely persist after the husband's retirement, with the husband receiving pension income and the wife continuing household work. Finally, the model indicates that once the pension division rule is enforced, for the wife the potential benefits from divorce may outweigh those associated with remaining married.

Figure 2: Distribution of husband's share in labor income and household work time

(a) Husband's labor income share



(b) Husband's household work time share



Notes: Based on data from the Japanese Panel Survey of Consumers (JPSC), conducted by the Panel Data Research Center at Keio University. This figure depicts the distribution of the husband's share of labor income among JPSC couples. The sample is restricted to couples who, as of 2006, had at least one salaried worker (i.e., not self-employed) and for whom self-employment income accounted for less than 50% of their total labor income. For these couples, the husband's labor income (household work time) share is calculated as the share of the husband's cumulative labor income (household work time) in the couple's cumulative labor income earned (time spent on household work) during marriage prior to the reform (i.e., prior to 2007).

3.2 Baseline model

Our model is a single-period model that integrates the few years before the husband's retirement and the subsequent 20 to 30 years until the end of his life into a single period. This simplification is justified for the following reasons. First, in 2007, the average life expectancy in Japan was 86 years for women and 80 years for men. This suggests that for couples in which the husband is nearing retirement age, the post-retirement period is substantially longer than the limited years preceding it. Second, as explained in Section 3.1, the main subjects of the theoretical analysis are middle-aged and older couples for whom the distinction between the period of human capital investment and its returns—relevant for younger couples—is not necessary. Third, in the model, both spouses are allowed to work part-time while receiving pensions; however, pensions are assumed to be the primary source of income during old age. As a result, household income remains relatively stable over time. Given these considerations, it is reasonable to treat the period from several years prior to retirement until the end of life as a single period.[13]

We also assume unilateral divorce in our model. As discussed in Section 2.4, while Japanese law formally requires the agreement of both spouses to divorce, the degree of freedom to divorce is relatively high in practice. Thus, assuming unilateral divorce simplifies the model without significantly departing from the realities of divorce decision-making for Japanese couples.

Our model builds on the framework developed by Becker (1973) and Becker (1974), which assumes that either spouse may choose to divorce if their utility within the marriage falls below their expected utility after divorce. Drawing on this framework, Amilon (2015) provides a diagrammatic analysis to examine how government policies can influence couples' decision to divorce. In contrast, this study analytically examines

[13]The qualitative effects of pension division remain unchanged even if we adopt a two-period model for slightly younger couples (i.e., those married for a shorter time) and explicitly distinguish between the husband's pre-retirement and post-retirement periods. That is, generally, the larger the pensionable earnings subject to division at the time of divorce, the greater the likelihood of divorce after the pension reform.

the effects of pension division. Through numerical analysis, we demonstrate a scenario in which a couple prefers to remain married before the pension division reform, while the wife opts for divorce after the reform.

Each spouse decides whether to remain married or divorce by comparing their utilities under two scenarios — before and after the pension reform. A spouse's utility is a function of private goods consumption, leisure, and the consumption of household public goods. Within marriage, the couple maximizes the weighted sum of their utilities, where the weights reflect each spouse's bargaining power. This decision-making process achieves an efficient allocation and falls within the realm of collective models such as those proposed by Browning and Chiappori (1998) and Chiappori (1992).

Throughout this section, we use subscripts m and f to denote the husband and wife, respectively, and superscripts s and c to denote the states of being single or married (being a couple). The pension benefits that spouse i receives after divorce, denoted by z_i, satisfy the following condition:

$$z_m(\alpha) = b_m - \alpha \cdot (b_m - b_f), \qquad z_f(\alpha) = b_f + \alpha \cdot (b_m - b_f), \tag{1}$$

where b_i is the amount of pension benefits associated with the contributions made by spouse i during the marital period. The second term represents the transfer of pension benefits based on the marital period; $\alpha(\in [0, 0.5])$ represents the proportion by which the disparity in pension benefits between spouses, determined by contributions made during the marriage, is offset. The pension benefits after divorce in Japan can be represented as follows:

α = 0: Before the pension reform (i.e., no pension division rule),

α = 0.5: After the pension reform (i.e., the new pension division rule applies).

Accordingly, from (1) we have $z_i|_{\alpha=0} = b_i$, and $z_i|_{\alpha=0.5} = (b_m + b_f)/2$; that is, before the reform, pension benefits are awarded to each spouse in accordance with the

contributions made by each during the marital period, while after the reform, pension benefits calculated from the total contributions made by both spouses during the marital period are divided equally between them.

Focusing on actual Japanese pension benefits for people nearing retirement in 2007, we assume that

$$b_m > b_f.$$

This reflects the fact that the amount of b_i depends on the length of the employment period during marriage and that, for a typical Japanese couple around the age of 60 in 2007, a traditional division of labor prevailed, in which the husband worked outside the home while the wife was a homemaker.[14]

As noted in Section 2.2, even before the pension reform was implemented, a very small portion of the husband's pension benefits might be allocated to the wife as part of the property division at the time of divorce. Thus, we allow α to take a small positive value, such as $\alpha = 0.1$, even before April 2007.

The form of the utility function is identical for both the husband and the wife, and applies equally to the single and marital (couple) states. Specifically, it is given by:

$$u_i^k = \varphi_i\left(x_i^k\right) + \phi_i(1 - q_i^k - l_i^k) + e_i^k, \quad i = m, f \text{ and } k = s, c, \tag{2}$$

where x_i^k represents the consumption of private goods, l_i^k denotes labor supply in the external market, and e_i^k represents the consumption of household products. The time endowment is normalized to one for simplicity. We further assume that φ_i and ϕ_i are strictly concave.

[14]Pension contributions made by spouse i prior to marriage are not subject to pension division. Couples who were around the age of 60 in 2007 typically married at a relatively young age and had long marriages. Since the Japanese salary system was seniority-based, salaries during marriage were usually higher than those before marriage. Taking these factors into account, b_m is much larger than the pension benefits accrued before marriage. Therefore, pension reforms based on payments made during the marital period strongly affect couples' behavior. For this reason, this study does not consider pension benefits associated with contributions made before marriage.

Divorced singles

The household production function for a divorced single individual is given by

$$e_i^s = \kappa_i(q_i^s; n_i), \quad i = m, f, \tag{3}$$

where q_i^s presents household production, and n_i is the parameter indicating the productivity of spouse i. $\kappa_i(\cdot)$ is assumed to be strictly concave with respect to q_i.

The budget constraint is expressed as

$$x_i^s = z_i + w_i l_i^s, \quad i = m, f, \tag{4}$$

where w_i is wage. Maximizing (2) subject to (3) and (4) yields $x_i^{s*}(z_i(\alpha), w_i, n_i)$, $l_i^{s*}(z_i(\alpha), w_i, n_i)$, and $q_i^{s*}(z_i(\alpha), w_i, n_i)$. See the Theoretical Appendix for details. From these results, the utility of a divorced single individual is given by $u_i^{s*}(z_i(\alpha), w_i, n_i) = u_i^s(x_i^{s*}(\cdot), l_i^{s*}(\cdot), q_i^{s*}(\cdot))$. Consequently, u_i^{s*} depends on the pension benefit division ratio α.

Married couple

The household production function of a couple is given by

$$e_i^c \equiv \frac{\kappa_m(q_m^c; n_m) + \kappa_f(q_f^c; n_f)}{\theta}, \quad i = m, f. \tag{5}$$

The household public good is simply defined as the sum of each spouse's household production, discounted by θ, which satisfies $1 \leq \theta$, to capture congestion, diseconomies of scale, and other factors arising from an increase in household members.

In our analysis, we treat marital allocation as a collective decision. The couple's utility, u^c, is given by $u^c = \gamma_m u_m^c + \gamma_f u_f^c$, where γ_i is the bargaining power of spouse i and satisfies $\gamma_m + \gamma_f = 1$. We assume that spouses' bargaining power remains constant throughout their marriage. That is, traditional Japanese social norms solidify

the husband's strong bargaining power within the family. Of course, it is possible that the pension reform may have strengthened women's bargaining position, but our numerical analysis suggests that wives determined to get divorced as a result of the new pension division still prefer to do so, even if the reform increased their bargaining power somewhat. Using (5), the couple's utility can be expressed as:

$$\begin{aligned} u^c &= \gamma_m \cdot \left(\varphi_m \left(x_m^c \right) + \phi_m (1 - q_m^c - l_m^c) + \frac{\kappa_m (q_m^c; n_m) + \kappa_f (q_f^c; n_f)}{\theta} \right) \\ &\quad + \gamma_f \cdot \left(\varphi_f \left(x_f^c \right) + \phi_f (1 - q_f^c - l_f^c) + \frac{\kappa_m (q_m^c; n_m) + \kappa_f (q_f^c; n_f)}{\theta} \right). \end{aligned} \tag{6}$$

The budget constraint of the couple is

$$x_m^c + x_f^c = z + w_m l_m^c + w_f l_f^c, \tag{7}$$

where $z \equiv z_m + z_f = b_m + b_f$. It should be noted that the couple's budget, as given by (7), is independent of the pension benefit division ratio α, because z is independent of α. Hence, the utility of each spouse in marriage is also independent of α. Maximizing (6) subject to (5) and (7) yields $x_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta)$, $l_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta)$, and $q_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta)$. Each spouse's allocation depends on their partner's parameters, but these allocations are independent of the pension benefit division parameter α due to the unified budget of the couple based on collective decision-making. Substituting these expressions into (6) yields $u_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta) = u_i^c(x_i^{c*}(\cdot), l_i^{c*}(\cdot), q_m^{c*}(\cdot), q_f^{c*}(\cdot))$, which also is independent of α, unlike the utility of a single individual.

Welfare comparison

For simplicity, we assume that marital dissolution entails no costs.[15] Therefore, for the 2007 pension reform to incentivize a wife to divorce, the following condition must

[15] Although divorce costs include legal fees and the time and effort required to find a new residence, the model analysis ignores these costs because they are relatively small when considering the 20–30 years after a divorce as one period.

hold:

$$u_f^{s*}\big|_{\alpha=0} < u_f^{c*} < u_f^{s*}\big|_{\alpha=0.5}. \tag{8}$$

The first inequality shows that prior to the introduction of pension division, the wife prefers to remain married. The second inequality shows that following the reform and the introduction of pension division, the wife prefers to divorce.

Let us now consider the case where for the husband the following condition is satisfied:

$$u_m^{s*}|_{\alpha=0.5} < u_m^{s*}|_{\alpha=0} < u_m^{c*}. \tag{9}$$

The first inequality is always satisfied. From (1), we have: $z_m|_{\alpha=0} - z_m|_{\alpha=0.5} = (b_m - b_f)/2 > 0$, where the inequality follows from the assumption that $b_m > b_f$. Thus, we have $u_m^{s*}|_{\alpha=0.5} < u_m^{s*}|_{\alpha=0}$. The second inequality shows that, even in the absence of pension benefit division, the husband prefers to remain married. This result implies that the gains from household public goods are relatively large for the husband. The underlying mechanism is that the wife is a major contributor to household production in exchange for income (consumption).

Numerical analysis

This section presents a numerical examination of the effects of the Japanese pension division reform of April 2007. To isolate the effects of the pension benefit reform, we consider the following subutility functions:

$$\varphi_i\left(x_i^k\right) = \frac{t_i \cdot (x_i^k)^\rho}{\rho}, \quad 0 < \rho < 1 \text{ and } t_i \text{ is constant}, \tag{10}$$

$$\phi_i(1 - q_i^k - l_i^k) = \frac{g_i \cdot (1 - q_i^k - l_i^k)^\delta}{\delta}, \quad 0 < \delta < 1 \text{ and } g_i \text{ is constant}, \tag{11}$$

The functional form of κ_i simply takes the form:

$$\kappa_i(q_i^k; n_i) = \frac{v_i \cdot (n_i q_i^k)^\sigma}{\sigma}, \quad 0 < \sigma < 1 \text{ and } v_i \text{ is constant}. \tag{12}$$

The parameters take the following values: $b_m = 0.38$, $b_f = 0.0$, $v_m = v_f = 1.5$, $t_m = t_f = 2.08$, $g_m = g_f = 0.5$, $\theta = 1.56$, $w_m = 0.57$, $w_f = 0.39$, $n_m = 0.038$, $n_f = 0.33$, $\gamma_m = 0.553$, and $\gamma_f = 0.447$.

Two points should be noted regarding the values of the parameters. First, the difference between w_m and w_f is not as large as the difference between n_m and n_f. In Japan, a person's previous career plays a relatively minor role in reemployment after retirement, and even when individuals are rehired by their former employer, it is common for their salaries to be considerably lower than their pre-retirement salaries. In contrast, the wife's proficiency in household tasks, accumulated over the course of marriage, does not suddenly decline after her husband's retirement. Second, we assume that the husband's bargaining power is larger than that of the wife, which aligns with Japanese cultural norms of those aged in their 50s and 60s in 2007, where the husband's bargaining power would typically be higher.

Given the functional forms and parameter values described above, we manipulate α from 0, reflecting the Japanese pension system before April 2007, to 0.5, reflecting the system after April 2007. The wife's utility is depicted in Figure 3(a) and the husband's in Figure 3(b). In the figures, the red line shows utility as a single, while the blue line shows utility in marriage. The numerical results satisfy conditions (8) and (9). Both wife and husband prefer to stay married when $\alpha = 0$, i.e., before the pension reform. In this numerical analysis, the wife's labor supply in the external market is close to zero, indicating she is a homemaker during marriage, as shown in Appendix Figure B1.[16] Our numerical results for $\alpha = 0$ suggest that the benefits of marriage arise from gender specialization, where the husband assumes the breadwinner role and the wife manages household production, and the two exchange their respective contributions. When $\alpha = 0.5$, i.e., after the pension division reform, Figures 3(a) and 3(b) show that the wife prefers divorce while the husband wants the marriage to continue. An increase in the wife's pension benefits reduces her incentive to exchange household

[16] Our numerical analysis shows that the labor supply of both the husband and wife in the external market is non-negative for $\alpha \in [0, 0.5]$, regardless of whether they remain married or get divorced.

production for income. The advantage of supplying more intrahousehold production becomes smaller for the wife, and the disadvantages of marriage grow.[17] This result is qualitatively consistent with Becker's (1991) argument.

Figure 4 depicts the difference between the wife's utility as a single under $\alpha = 0.5$ and her utility in marriage, $u_f^{s*}\big|_{\alpha=0.5} - u_f^{c*}$, along with the pension benefits associated with the contributions made by the husband during marriage, b_m. As b_m increases, the wife's incentive to divorce grows. This is because long hours spent on household work lead to a substantial welfare loss, whereas the time burden is significantly reduced when she is single, as shown in Appendix Figure B2. Since b_m tends to be larger for couples with longer marriages or when the husband was employed by a large firm, we expect such couples to be more strongly affected by the pension reform. This will be empirically tested in the following sections.

3.3 Model with match quality

This section examines the effects of incorporating match quality into the utility functions. Let ε_i denote the match quality of spouse i within the marriage. We then modify the utility function under marriage as follows:

$$u_i^c = \phi_i(x_i^c) + \varphi_i(1 - q_i^c - l_i^c) + e_i^c + \varepsilon_i, \quad i = m, f. \tag{13}$$

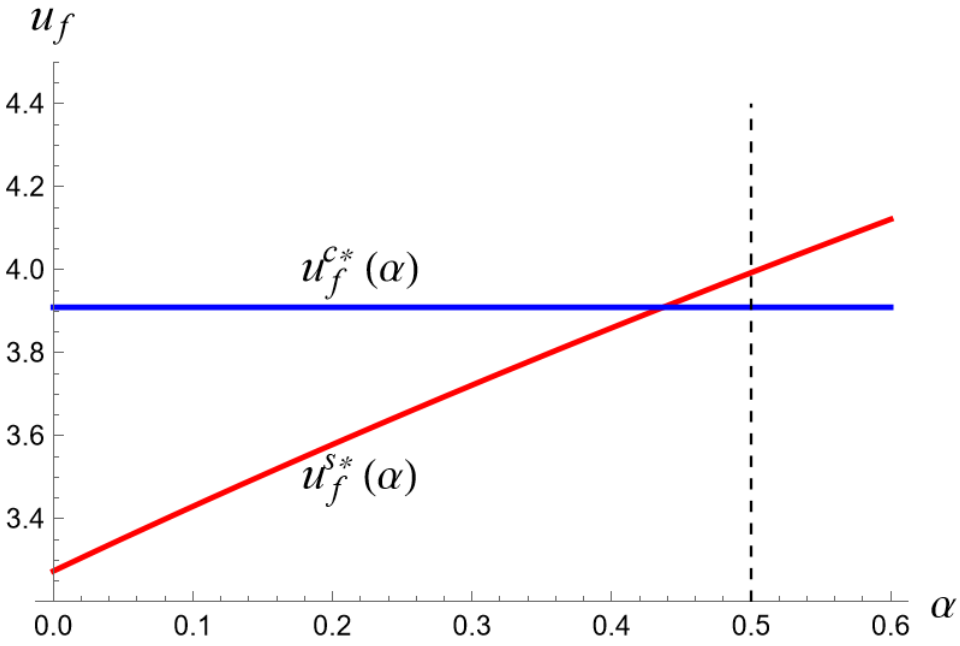
Here, match quality ε_i enters as a linear term, following the standard approach of Weiss and Willis (1997). The household utility of the couple is given by

$$\begin{aligned} u^c \;=\; & \gamma_m \cdot \left(\varphi_m\left(x_m^c\right) + \phi_m(1 - q_m^c - l_m^c) + \frac{\kappa_m(q_m^c; n_m) + \kappa_f(q_f^c; n_f)}{\theta} + \varepsilon_m \right) \\ & + \gamma_f \cdot \left(\varphi_f\left(x_f^c\right) + \phi_f(1 - q_f^c - l_f^c) + \frac{\kappa_m(q_m^c; n_m) + \kappa_f(q_f^c; n_f)}{\theta} + \varepsilon_f \right). \end{aligned} \tag{14}$$

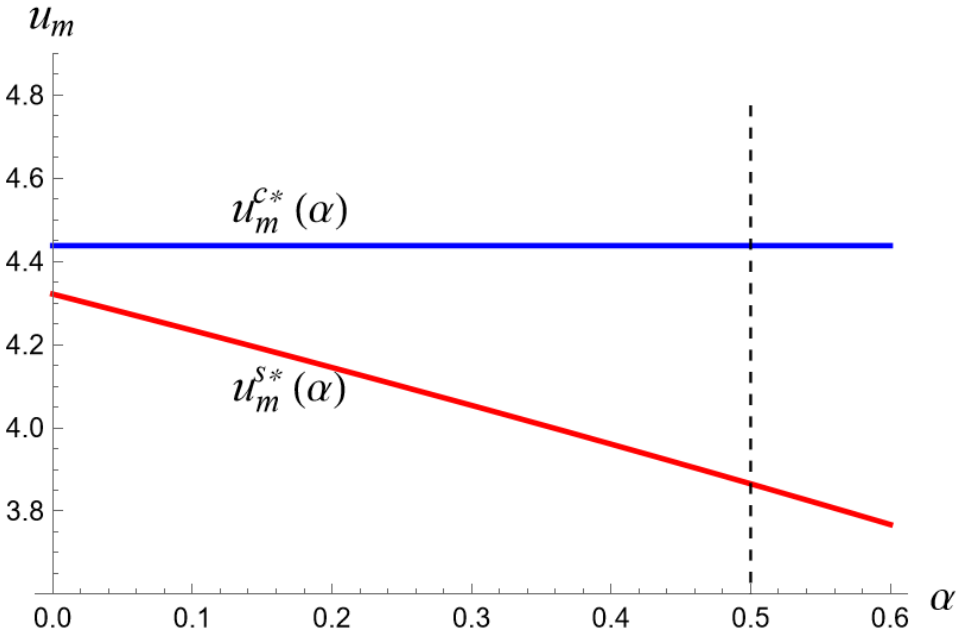
[17] While pension division may increase the wife's bargaining power, our numerical analysis shows that even if her bargaining power increases somewhat, her utility under pension division remains higher when single.

Figure 3: Impact of pension division upon divorce on utility

(a) Wife's utility

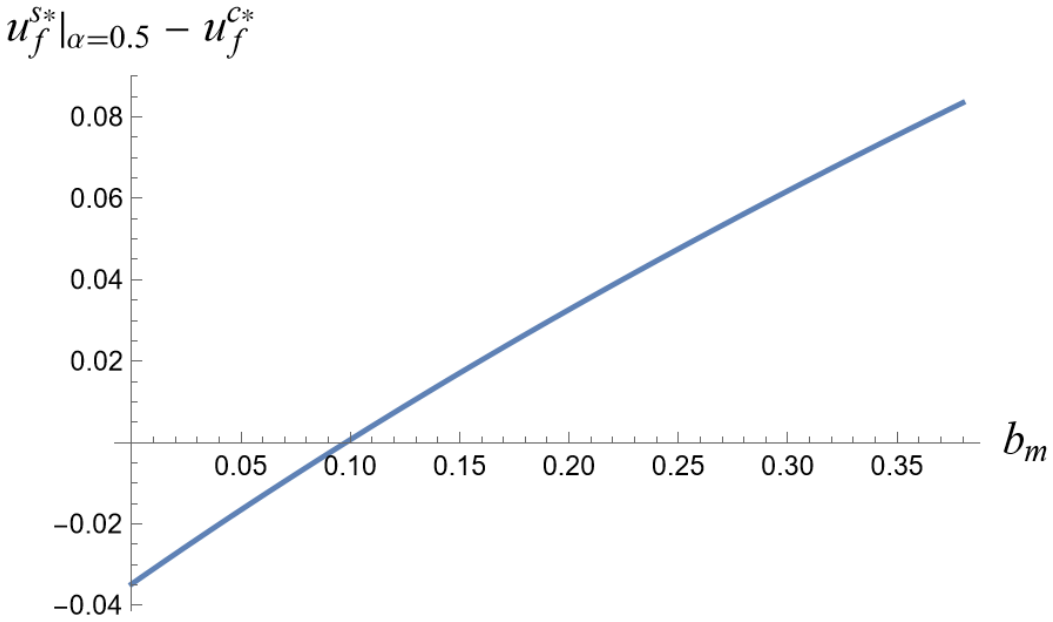


(b) Husband's utility



Notes: The vertical axis measures the utility level, while the horizontal axis represents the pension division ratio (α). Figures 3(a) and 3(b) depict the utility levels of the wife and husband, respectively. In each figure, the red line indicates the utility level as a single and the blue line indicates the utility level when married. With equal pension division ($\alpha = 0.5$), the wife has a higher utility level when she is single. On the other hand, the husband always has a higher utility level when married.

Figure 4: Difference in the wife's utility between being single and married and the husband's pension benefits



Notes: The vertical axis represents the difference between the wife's utility level as a single under pension division ($\alpha = 0.5$) and her utility level within marriage. The horizontal axis represents the magnitude of the pension benefit (b_m). A positive value on the vertical axis implies that the wife opts for divorce, while a negative value indicates she prefers to remain married. The larger the pension benefit, the greater is the incentive of pension division for the wife to divorce.

Because ε_i enters the household utility function (14) linearly, it does not affect the first-order conditions for the household's optimization problem. Therefore, the optimal allocation remains unchanged, and we have $du_i^c = d\varepsilon_i$ from (13). This implies that the utility line for u_i^c (shown as the blue line in Figures 3(a) and 3(b)) shifts vertically by ε_i, while the line for u_i^s (the red line) remains unaffected. Consequently, a lower (or even negative) match quality for the wife lowers her u_i^c, increasing the likelihood that she initiates divorce. Even with the same utility function, variation in match quality leads some wives to prefer divorce after the introduction of the new pension division rule, while others prefer to stay married.[18]

[18]Incorporating match quality into the model raises the possibility that couples may proceed with divorce even when the proportion of pension entitlements transferred to the dependent spouse upon divorce is relatively low—provided that the match quality is sufficiently poor. Indeed, as shown in Appendix Table A1, around 1% of divorcing couples separated despite the dependent spouse being

3.4 Model allowing for endogenous bargaining power

The results derived in Section 3.2 rest on the assumption that intra-household bargaining power remains constant, even after the introduction of pension division. For Japanese middle-aged and older couples in 2007—when traditional gender norms were still deeply ingrained—this assumption is arguably reasonable. Nevertheless, a husband might reduce his bargaining power down to his reservation utility in an attempt to preserve the marriage. However, as illustrated in the numerical example in Section B.5, the wife may still prefer divorce even when bargaining power is treated as endogenous. This outcome stems from the presence of household public goods that generate intra-marital externalities, because after divorce, such externalities no longer exist, leading to a different slope of the Pareto frontier between marriage and singlehood (Chiappori *et al.*, 2015). Consequently, situations may arise in which the wife strictly prefers divorce, regardless of how much the husband adjusts his bargaining position.

4 Data description

4.1 Vital Statistics on Divorces

This study utilizes microdata from the Vital Statistics on Divorces compiled by the Ministry of Health, Labour and Welfare. This is an administrative dataset that contains a complete record of all legally registered divorces in Japan since January 1973. Importantly, it includes the month and year when each divorce was finalized (i.e., the date when the divorce registration was submitted), allowing us to calculate the monthly number of divorces over the study period.

The dataset also provides detailed information on the occupation of the primary earner in each divorced couple and the length of marriage. These variables are crucial for distinguishing between couples who were likely to be more and less affected by the

entitled to receive less than 30% of the combined pension entitlements. One possible explanation for this is that the match quality in these marriages was particularly low.

2007 pension reform. Specifically, based on the primary earner's occupation, couples are classified into the following seven groups: (1) Farmer (including part-time farmer), (2) Self-employed, (3) Working for a small to medium-sized firm (fewer than 100 employees), (4) Working for a large firm (including executives in company organizations and government workers), (5) Others (those working but not falling into the categories above, including those in temporary employment or with short-term contracts), (6) Unemployed (where no household member is employed), and (7) N.A. Meanwhile, we calculate the length of a couple's marriage based on information on when the couple began cohabiting and their divorce registration. The reason is that while the dataset does not provide the exact month and year when the marriage was registered, it does record the month and year when the couple started living together. We use this information as a proxy for the marriage date. The length of marriage is then calculated as the period between the start of cohabitation and the month of divorce registration.

It should be noted that although the Vital Statistics on Divorces are rich in many respects, they do not include certain information that would be helpful for our analysis. For couples with a firm-employed primary earner and longer marriage durations, which are the focus of our analysis below, we assume—in line with the theoretical analysis presented in Section 3—that these couples consist of a husband working for a firm and a wife who is a full-time homemaker or a low-income part-time worker. Unfortunately, however, the Vital Statistics on Divorces do not contain income information for either spouse, making it impossible to directly verify this assumption. Nevertheless, in Section 3.1, we use alternative data sources to show that this assumption is plausible.

While the occupation of the primary earner reported in the Vital Statistics on Divorces refers to the time of divorce, it does not necessarily reflect the individual's occupation throughout the entire duration of the marriage. To examine whether this information is a valid proxy for the primary earner's occupation during marriage, we turn to the JPSC dataset used for Figure 2(a), which covers couples who, as of 2006, had at least one salaried worker (i.e., not a farmer or self-employed worker) and for whom income from farming or self-employment accounted for less than 50% of the

couple's total labor income. For these husbands, we find that the number of years they worked as salaried employees prior to 2006 accounts for 95.8% of the years observed in the JPSC dataset—namely, from 1993 (the first survey year) or from the year of marriage for those who married after 1993. This indicates that those who were salaried workers in 2006 were very likely to have been salaried workers in earlier years as well. Therefore, using the occupation of the primary earner at the time of divorce to identify couples who were most affected by the pension reform is a reasonable approach.

Further, we use the following criteria to restrict the divorces on which our analysis below focuses. First, to exclude couples less likely to be affected by the Japanese pension reform, the sample is restricted to divorces where at least one spouse holds Japanese nationality.[19] Couples excluded based on this criterion account for less than 2% of divorces in any given year, ensuring minimal loss of generality. Second, our analysis focuses on the period from FY2002 to FY2010, though the Vital Statistics dataset spans from January 1973 onward. The following two factors influenced this decision: (i) the Great East Japan Earthquake in March 2011, and (ii) long-term trends in later-life divorces among older, long-married couples (known as *jukunen rikon* in Japanese). Regarding (i), the earthquake had a substantial impact on divorce decisions (Kureishi *et al.*, 2025), leading to a 6.2% reduction in divorce cases between 2010 and 2011. This sharp decline stands in contrast to the relatively minor effect of the 2008 global financial crisis, which caused only small fluctuations of about 1% in divorce numbers.

Regarding (ii), since later-life divorces have been increasing for reasons unrelated to the pension reform, we focus on the four years after the reform in order to isolate the effect of the reform and separate it from other trends such as the increase in *jukunen rikon* and in the divorce rate more generally. For instance, the share of divorces among couples married for 20 years or more has risen from 18.5% (=49,015/264,246) in 2000

[19]While foreign residents in Japan are also required to enroll in the public pension system, if both spouses are non-Japanese nationals, they may have only temporarily resided in Japan and thus have shorter enrollment periods. As a result, the extent to which Japan's pension division upon divorce influences their divorce decisions may be limited.

to 23.1% (=44,697/193,253) in 2020. One potential reason for this increase is that, due to the increase in life expectancy, the period after a husband retires is becoming longer, and during this time, an increasing number of couples are finding that their relationship is not going well (or are anticipating that it will not be). Enhanced remarriage opportunities through online matchmaking platforms and reduced stigma of later-life divorce have also contributed to this trend.

Focusing on the FY2002–FY2010 period thus avoids confounding effects from these disruptions and ensures that the analysis captures the impacts of the 2007 pension reform within a stable socio-economic context. While this timeframe also encompasses the global financial crisis, its effects on divorce were modest compared to those of the earthquake as explained above, making it less likely to bias our results.

4.2 Definition of adjusted divorce incidence

We use the "adjusted divorce incidence" calculated for different marriage durations as our primary divorce measure. The calculation of this measure draws on microdata from both divorce and marriage records in the Vital Statistics, both available from January 1973 onward. For couples with a marriage length of l in month m in year y, the adjusted divorce incidence is calculated by dividing the number of divorces in month m of a year by the number of couples who were still married at the end of the previous month, $m-1$. While the deaths of married individuals would also affect the number of couples, these are not accounted for in the calculation because data on widowhood are not available.

We calculate the adjusted divorce incidence for each occupation category of the primary earner among divorced couples. In this calculation, the numerator is the number of divorces split by the primary earner's occupation, while the denominator is the total number of couples continuing their marriage, regardless of occupation. Therefore, this divorce measure should not be interpreted as the probability of divorce for couples in a particular occupation, but rather as the number of divorces adjusted

for differences in the number of couples remaining married by length of marriage. Nevertheless, compared to previous studies using crude divorce rates, our measure is more accurate because it accounts for demographic (cohort-level) differences in the number of marriages in a particular year.

The number of couples continuing their marriage can only be calculated for couples who married after January 1973, because marriage records in the Vital Statistics are only available from that point onward. Therefore, to calculate the divorce measure for couples with a specific marriage length, the corresponding length of time must have passed since January 1973. Consequently, it is impossible to calculate our divorce measure for couples with very long marriage lengths. For instance, the divorce incidence for couples married 40 years as of April 2002 cannot be calculated because no such couples existed in the dataset at that point. Accordingly, we mainly focus on couples who divorced within 359 months (less than 30 years) of marriage.[20] Furthermore, the number of couples with up to 359 months of marriage can only be counted from FY2002 onward, which is why our sample period begins in FY2002.

4.3 Descriptive statistics and trends

Table 1 presents descriptive statistics for the divorce data used in our analysis from 2002 to 2010. The number of divorces declined steadily from 2002 to 2008 and then remained relatively flat. Given that (although not shown in Table 1) the number of divorces had followed an upward trend until 2002, reflecting the economic downturn referred to as the "Lost Decade" in the wake of the collapse of Japan's bubble economy in the late 1980s, the downward trend after 2002 likely is due to the economic expansion that lasted from February 2002 to March 2009, consistent with the finding of Sakata and McKenzie (2009) that the divorce rate in Japan is counter-cyclical. The mean ages of husbands and wives at the time of divorce remained stable until 2006 but rose

[20] As a robustness check, in Section 6.6 we estimate the model using the natural log of the number of divorces as the dependent variable, instead of the natural log of the adjusted divorce incidence, focusing on couples who divorced after 360 months (30 years) of marriage. The results remain qualitatively unchanged regardless of which divorce measure is used.

discontinuously in 2007, when the new pension division rule commenced. Similarly, the average length of marriage prior to divorce rose after 2007, consistent with the hypothesis that older and longer-married couples were more likely to be affected by the new pension division rule. Turning to the occupation of the primary earner, the share of farmers and the self-employed slightly decreased, reflecting the long-term decline in the number of people engaged in these occupational categories. In contrast, the share of workers employed by firms remained relatively stable – both in the case of those working for large firms and those working for small and medium-sized firms.

Table 1: Descriptive statistics

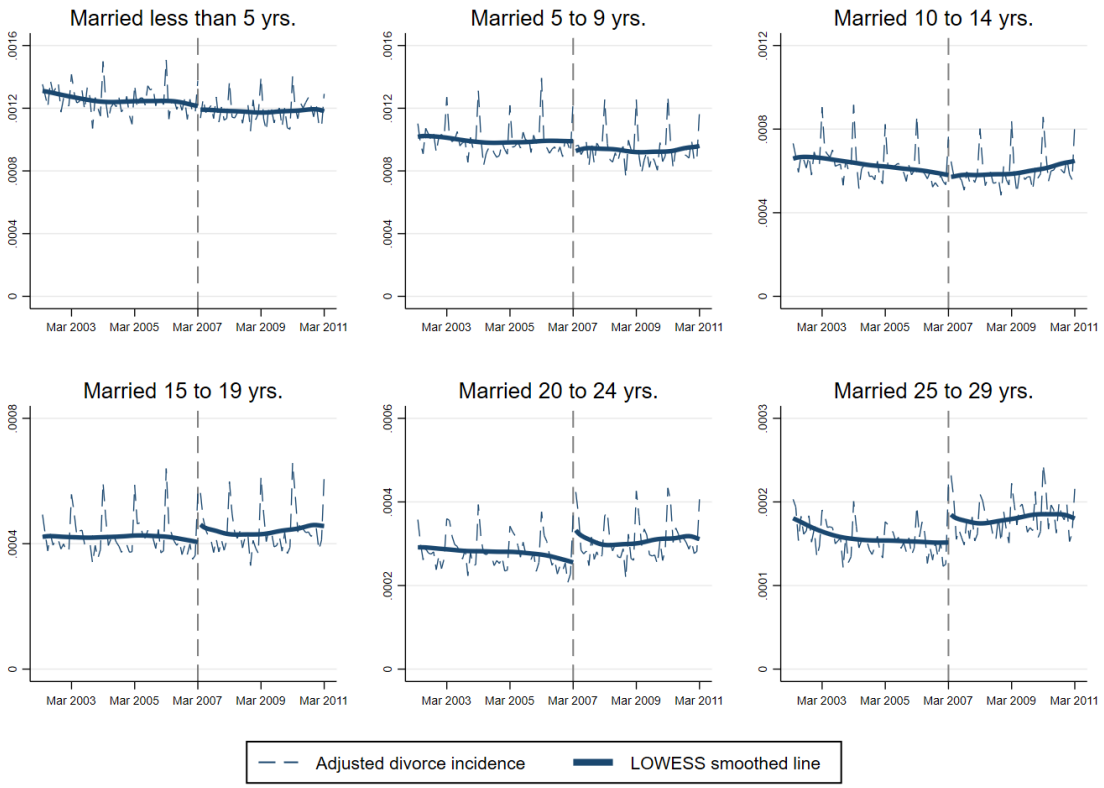
		Age			**Occupation of the primary earner of divorced couples**					
CY	**N**	Husband	Wife	**Length of marriage**	Farmer or self-employed	Working for a small to medium-sized firm	Working for a large firm	Not in labor force	Other	N.A.
2002	289,836	39.54	36.72	135.7	0.175	0.355	0.234	0.053	0.110	0.074
		(11.38)	(10.7)	(117)	(-)	(-)	(-)	(-)	(-)	(-)
2003	283,854	39.77	36.95	136.9	0.173	0.351	0.231	0.054	0.109	0.083
		(11.46)	(10.74)	(117.8)	(-)	(-)	(-)	(-)	(-)	(-)
2004	270,804	39.82	37.01	136	0.168	0.350	0.234	0.053	0.107	0.089
		(11.47)	(10.75)	(117.9)	(-)	(-)	(-)	(-)	(-)	(-)
2005	261,917	39.96	37.13	135.9	0.166	0.362	0.247	0.054	0.101	0.070
		(11.5)	(10.75)	(117.9)	(-)	(-)	(-)	(-)	(-)	(-)
2006	257,475	39.99	37.11	133.8	0.161	0.357	0.243	0.050	0.099	0.090
		(11.5)	(10.69)	(117.2)	(-)	(-)	(-)	(-)	(-)	(-)
2007	254,832	40.54	37.58	138.5	0.155	0.352	0.250	0.047	0.096	0.100
		(11.69)	(10.91)	(121.3)	(-)	(-)	(-)	(-)	(-)	(-)
2008	251,136	40.73	37.75	138.5	0.152	0.349	0.252	0.046	0.093	0.109
		(11.71)	(10.91)	(120.6)	(-)	(-)	(-)	(-)	(-)	(-)
2009	253,354	41.08	38.1	140.4	0.150	0.344	0.248	0.054	0.094	0.111
		(11.83)	(11.06)	(122.3)	(-)	(-)	(-)	(-)	(-)	(-)
2010	251,379	41.28	38.3	141.8	0.153	0.357	0.260	0.060	0.096	0.075
		(11.84)	(11.05)	(122.5)	(-)	(-)	(-)	(-)	(-)	(-)

Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The table reports the mean values for each variable, with standard deviations shown in parentheses. "CY" and "N" denote calendar year and number of observations, respectively. The unit for "Length of marriage" is months. Each variable representing the "Occupation of the primary earner of divorced couples" is a dummy variable that takes a value of 1 if the occupation of the primary earner matches the respective category.

Turning to the time trends in the adjusted divorce incidence, Figure 5 depicts trends in the monthly divorce incidence for couples whose primary earner worked either for a small to medium-sized firm or a large firm (referred to hereafter as "couples with

a firm-employed primary earner") from FY2002 to FY2010 (i.e., April 2002 to March 2011). This analysis is repeated for six marriage length categories, each spanning five years, as shown in Figure 5.[21]

Figure 5: Monthly developments in the adjusted divorce incidence (FY2002 to FY2010)



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The dashed lines represent monthly developments in the adjusted divorce incidence from FY2002 to FY2010, while the bold solid lines represent locally weighted scatterplot smoothing (LOWESS), applied separately to the periods before and after the pension reform. This figure focuses on couples where the primary earner was employed by a firm.

In the panels, the dashed line depicts trends in the adjusted divorce incidence,

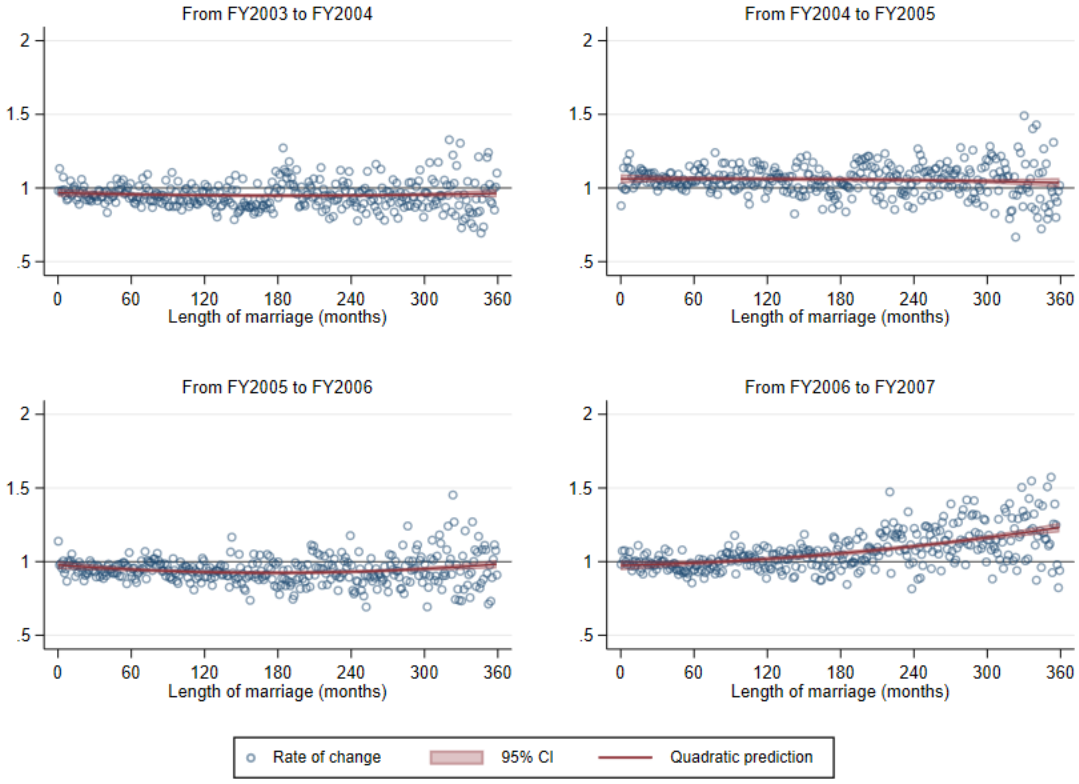
[21] Appendix Table A2 presents the proportion of divorced couples in each of the six marriage length categories. Since divorces tend to be more prevalent among couples with shorter marriage lengths, couples married for less than 15 years constitute approximately three-quarters of all divorces in each year. The remaining categories–couples married for 15 years or longer–account for about 4% to 11% of divorces.

which exhibits strong seasonality, with a spike in March.[22] To ensure that this seasonality does not obscure broader patterns, we add the bold solid line representing a locally weighted scatterplot smoothing (LOWESS), applied separately for the periods before and after the pension reform (i.e., before March 2007 and from April 2007 onward). The panels indicate that couples with longer marriage lengths (specifically, those married for 15 years or more) show a discontinuous jump in the divorce measure between March 2007 and April 2007. In contrast, for couples with shorter marriage lengths (less than 15 years), the LOWESS lines connect smoothly throughout the study period. These patterns align with our hypothesis. Furthermore, for the period before March 2007, all figures show either a flat or slightly downward trend, with no significant differences in trends across marriage lengths. While we conduct formal parallel trend tests using regression models in Section 5, visual inspection suggests no substantial differences in trends by marriage length.

Next, Figure 6 presents a scatterplot illustrating the relationship between the annual rate of change in the adjusted divorce incidence and marriage length (ranging from 0 to 359 months) for couples with a firm-employed primary earner. For the two-year periods that do not include the new pension division rule—fiscal years 2003 to 2004, 2004 to 2005, and 2005 to 2006—the change in divorce incidence shows little variation by marriage length. The quadratic prediction lines for these periods are nearly flat, although their levels shift up or down depending on the year. These vertical shifts reflect differences in the average divorce incidence across years. In contrast, the change in the divorce incidence from FY2006 to FY2007 is larger for couples with longer marriage lengths. Specifically, no noticeable changes are observed for couples married up to approximately 120 months. However, beyond 120 months, the change in divorce incidence rises steadily and continues up to 359 months. This pattern is also consistent with our hypothesis.

[22] March marks the end of the fiscal year for many Japanese firms and the end of the school year for children. Additionally, as Japan does not officially allow married couples to retain separate surnames, a surname change due to marriage or divorce may motivate couples to finalize their marriages in March to avoid such changes during the fiscal or school year.

Figure 6: Annual rate of change in adjusted divorce incidence



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure depicts the annual rates of change in adjusted divorce incidence (vertical axis), categorized by the length of marriage measured in months (horizontal axis). The red curves represent the quadratic predictions of the relationship, along with their 95% confidence intervals shown as shaded light red areas. This figure focuses on couples where the primary earner was employed by a firm.

Finally, we consider firm size as another proxy for the total amount of pension contributions subject to property division upon divorce. In Japan, there has been a tendency for larger firms (in terms of the number of employees) to offer higher salaries. We therefore classify couples with a firm-employed primary earner into those employed by a small to medium-sized firm and those employed by a large firm, and replicate Figures 5 and 6 for each group. The results are shown in Appendix Figure A3 and indicate that the latter group, which tended to have higher salaries, exhibits a clearer discontinuity in the incidence of divorce before and after the pension reform.[23] Furthermore, Appendix Figures A4(a) and A4(b) show a stronger positive correlation between the annual rate of change in divorce incidence from FY2006 to FY2007 and marriage length than in the other two-year periods. Moreover, this positive correlation is more pronounced among couples where the primary earner was employed by a large firm than among couples where the primary earner was employed by a small to medium-sized firm. From Section 5 onward, we employ a regression framework to test whether the patterns observed in the figures so far persist after controlling for other factors.

5 Empirical strategies

This section explains the empirical strategies we use to estimate the impact of the pension reform on divorce decisions. We primarily employ a difference-in-differences (DID) framework and additionally implement a triple-differences analysis to address potential identification concerns.

[23]The adjusted divorce incidence for couples whose primary earner was employed by a small to medium-sized firm is higher than that for couples whose primary earner was employed by a large firm. This is due to the larger number of divorced couples in the former group and does not imply that couples in the former group were more likely to divorce.

5.1 Difference in differences

In the DID analysis, we compare changes in the adjusted divorce incidence between the periods prior to FY2007 and in or after FY2007, when the new pension division rule was introduced, between couples more likely to be affected by the reform (treatment group) and those less likely to be affected (control group). As described in Section 4.1, couples are classified into these groups based on two factors: the occupation of the primary earner and the length of marriage. The treatment group consists of couples with a firm-employed primary earner and longer marriage durations, while the control group consists of couples in which the primary earner is also firm-employed but the duration of marriage is shorter. Specifically, couples married for less than five years are considered minimally affected by the reform and serve as the control group. The effect of the reform is estimated as the difference in changes in the adjusted divorce incidence between the treatment and control groups.

To implement this estimation strategy, we classify couples into several groups (hereafter referred to as "cells") based on the length of their marriage. Each cell represents a specific marriage duration category, and the adjusted divorce incidences within these cells serve as the observation values in our dataset. The Vital Statistics data provide the marriage length of divorced couples in months. However, dividing the marriage length into overly fine categories would result in too few divorces per cell, potentially leaving some cells empty and leading to unstable estimates. To ensure we obtain reliable results, we divide marriage length into 30 categories, each spanning 12 months. As described in Section 4.1, the observation period runs from FY2002 to FY2010. Consequently, the sample size used in our DID estimations is 3,240 (= 9 years $\times$ 12 months $\times$ 30 marriage length categories). Descriptive statistics for the adjusted divorce incidence, calculated at the cell level, are presented in Appendix Table A3.

To estimate the impact of the pension reform on divorce decisions, we use the

following equation:

$$\ln(D_{yml}) = \beta_0 + \sum_{\substack{y=2002 \\ y\neq 2003}}^{2010} \sum_{\substack{l=2 \\ l\neq 1}}^{6} \beta_{1yl} \times Year(y) \times Length(l) + \mu_{ym} + \nu_l + \varepsilon_{yml} \qquad (15)$$

where the dependent variable is the natural log of the adjusted divorce incidence in month m in year y for couples with marriage length l. $Year(y)$ is a dummy for fiscal year y. $Length(l)$ is a dummy variable that takes 1 if the marriage length falls into category l.

The parameter of interest is β_{1yl}, which represents the change in the divorce incidence compared to the reference year, FY2003 (the year prior to the pension reform announcement in FY2004).[24] The 30 marriage length categories were grouped into six broader categories for the estimation: less than 5 years, 5–9 years, 10–14 years, 15–19 years, 20–24 years, and 25–29 years. The category of less than 5 years serves as the reference, and coefficients are estimated for the other categories.

To control for the seasonality in the adjusted divorce incidence observed in Figure 5, we include year-month fixed effects (μ_{ym}). To control for the tendency, shown in the descriptive statistics in Table 1, that the frequency of divorce is higher among shorter-married couples, we include marriage-length fixed effects (μ_l). The error term is denoted as ε_{yml}. Standard errors are cluster-robust and clustered at the month and year of divorce level to account for potential common shocks that might affect divorce decisions across different marriage lengths.

When identifying couples with a firm-employed primary earner, there is a possibility that primary earners who were not previously employed by a firm (and thus not contributing to the Employees' Pension Insurance) before moving into firm employment could be mistakenly included in the treatment group. Such misclassification would likely bias the estimated effects of the pension reform downward, so the esti-

[24]The choice of the reference year may affect the estimation results. If, as discussed in Section 6.4, postponement behavior led to fewer divorces between 2004 and 2006 and more in 2007, selecting 2004, 2005, or 2006 as the reference year could result in an overestimation of the reform's effects.

mates should be interpreted as a lower bound. However, prior to 2007, the so-called "Japanese employment system" was prevalent in Japan, whereby individuals (particularly men) who joined a firm after graduating from school or university typically remained employed at the same firm (or its affiliates) until retirement. Given this context, the potential bias from such transitions into firm employment is expected to be minimal, if it exists at all.

In addition to the estimation focusing on couples with a firm-employed primary earner, we conduct the same estimation for couples where the primary source of household income was farming or self-employment (hereafter referred to as "couples with a farming- or self-employed primary earner"). Farmers and self-employed individuals are enrolled in different pension systems from firm-employed individuals and do not contribute to the Employees' Pension Insurance. Therefore, even with the 2007 pension reform, the pension benefits received by non-working spouses upon divorce would not increase for such couples. As a result, for couples with a farming- or self-employed primary earner, we conduct a falsification test to verify whether there is no significant increase in divorce incidence following the pension reform.

5.2 Triple differences

In Eq. (15), we estimate the difference in the rate of change in the adjusted divorce incidence across couples with different marriage lengths. However, if there are marriage-length-specific trends in the divorce incidence, independent of the pension reform, the identification of the reform's effect may be compromised. Specifically, at any given point in time, couples with longer marriage lengths are more likely to belong to older generations (born earlier), while those with shorter marriage lengths tend to belong to younger generations (born later). If the changes in the divorce incidence for the older and younger generations include generation-specific trends, then the difference in the changes in the divorce incidence between couples with longer and shorter marriage lengths will reflect both the effect of the pension reform and the

difference in generation-specific trends. To address this issue, we also conduct a triple differences analysis, using couples with a farming- or self-employed primary earner—who were unaffected by the pension reform—as a control group. This approach relies on the assumption that, in the absence of the reform, the trends in the divorce incidence would have been similar between couples with firm-employed primary earners and those with farming- or self-employed primary earners across different marriage lengths. The estimation equation is as follows:

$$\begin{aligned}\ln(D_{ymlo}) = \beta_0 + & \sum_{\substack{y=2002 \\ y\neq 2003}}^{2010} \sum_{\substack{l=2 \\ l\neq 1}}^{6} \beta_{1ylo} \times Year(y) \times Length(l) \times Firm(o) \\ & + \sum_{\substack{y=2002 \\ y\neq 2003}}^{2010} \sum_{\substack{l=2 \\ l\neq 1}}^{6} \beta_{2yl} \times Year(y) \times Length(l) \\ & + \sum_{\substack{y=2002 \\ y\neq 2003}}^{2010} \beta_{3yo} \times Year(y) \times Firm(o) \\ & + \sum_{\substack{l=2 \\ l\neq 1}}^{6} \beta_{4lo} \times Length(l) \times Firm(o) \\ & + \mu_{ym} + \nu_l + \theta_o + \varepsilon_{ymlo}\end{aligned} \tag{16}$$

where the dependent variable is the natural log of the adjusted divorce incidence in month m in year y for primary earner occupation category o with marriage length l. $Firm(o)$ is a dummy variable that equals 1 if the primary earner was employed by a firm, and 0 otherwise (i.e., if the primary earner is engaged in farming or self-employment). θ_o represents fixed effects for the occupation of the primary earner. The definitions of the other variables are identical to those in Eq. (15). The sample size for this estimation is 6,480 (= 9 years × 12 months × 30 marriage length categories × 2 primary earner occupation categories).

It is important to note that if there are trends specific to couples with a farming- or self-employed primary earner that are unrelated to the pension reform, even the

triple-differences analysis may fail to fully isolate the effect of the reform. To assess the severity of this potential issue, we examine whether there are any pre-existing trends unique to farming- or self-employed couples prior to the reform.

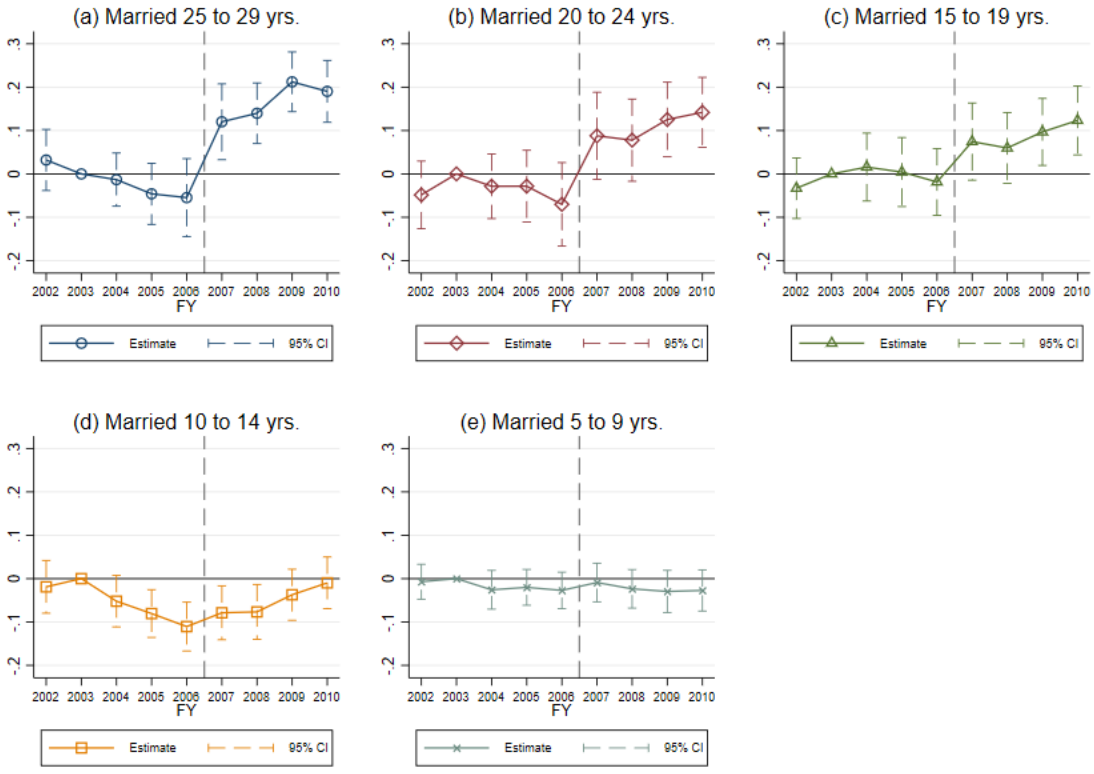
6 Results

6.1 The effect of the pension reform on the adjusted divorce incidence

Figure 7 presents the DID estimates of the difference in the changes in the adjusted divorce incidence from before to after the implementation of the new pension division rule for couples with a firm-employed primary earner, relative to couples married for less than five years, based on the estimates of β_{1yl} in Equation (15). Figures 7(a) to (c), which correspond to different ranges of marriage duration, all show a notable increase in divorces around FY2007. The most pronounced increase is found in Figure 7(a), where the divorce incidence among couples with the longest marriage lengths rose by approximately 10% in the first year after the reform and by 20% over the following two to three years; both changes are statistically significant. Figures 7(b) and (c), representing couples with slightly shorter marriage durations, also show increases of about 10%. The point estimates follow a clear decreasing order, with Figure 7(a) showing the highest values, followed by Figure 7(b), and then Figure 7(c). This pattern supports our hypothesis that the reform had a greater effect on longer-married couples due to the larger cumulative amount of pension contributions subject to division.

While these findings are consistent with our hypothesis, it could be argued that the observed pattern might instead reflect a higher prevalence of traditional single-earner households among longer-married couples—that is, households where the husband works full-time and the wife is a full-time homemaker or part-time worker. Since the pension division rule benefits dependent spouses most when there is a large earning disparity between spouses, this could potentially confound our interpretation. However,

Figure 7: Impact of the pension reform on adjusted divorce incidence



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1yl} in Eq. (15) for couples where the primary earner was employed by a firm, represented by the square markers in each panel. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. Each panel presents the estimates for couples with a different marriage length (l). Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between couples married for less than 5 years and those married for longer from the reference year FY2003 to the other fiscal years. The number of observations used in the estimation is 3,240. The dashed lines indicate the 95% confidence intervals for the estimates. Standard errors are clustered at the year-month (i.e., divorce date) level.

our tabulations using the 2005 Population Census—which reflects household structures immediately prior to the pension reform—reveal that such household structures were not limited to older age groups. Even among younger couples, the proportion of traditional single-earner households remained similarly high.[25] This suggests that the observed increase in divorces among longer-married couples is unlikely to be driven by differences in household type and is more plausibly attributed to the greater amount of pension contributions subject to division.

In contrast, couples with shorter marriage lengths show no significant increase in divorces following the pension reform. Figure 7(d), which focuses on couples married for 10 to 14 years, displays a declining trend in the divorce incidence beginning in FY2004. Although this decline tapers off after FY2007, there is no evidence of an increase in divorces compared to FY2003 (the reference year). Similarly, Figure 7(e), which focuses on couples married for 5 to 9 years, shows coefficients that are not statistically significant in any year, aligning with the expectation that the pension reform had a minimal impact on divorce among couples married for shorter periods.

Moreover, with the exception of Figure 7(d), the coefficients for the pre-reform period are not statistically significant, indicating no deviation from the parallel trend assumption relative to couples with marriage lengths under 5 years. These findings suggest that the increases in divorces observed in FY2007 in Figures 7(a) to (c) are likely attributable to the pension reform.

Next, we examine the estimation results by dividing couples with a firm-employed primary earner into two groups based on whether the primary earner worked for a large firm or a small to medium-sized firm. Comparing Figures 8(a) and 8(b), which respectively show results for couples with primary earners working for large firms and those working for small to medium-sized firms, we find that for couples married for 25

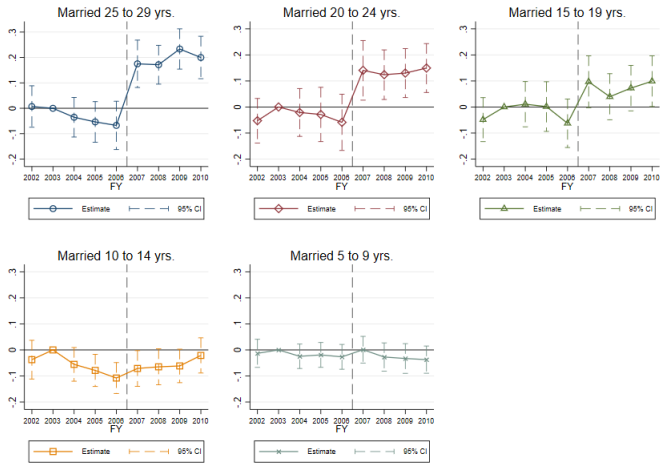
[25] In the 2005 Population Census, as noted in Section 3.1, in 64% of couples in which the husband was aged 55–59 and classified as "primarily working," the wife was either "engaged in household work in addition to work" or "not in the labor force." The corresponding shares for younger husband age groups were also high: 62% (50–54), 64% (45–49), 69% (40–44), 71% (35–39), 69% (30–34), 66% (25–29), and 73% (20–24).

to 29 years and 20 to 24 years, the estimated coefficients are consistently larger across all years for those where the primary earner worked for a large firm. However, for couples married for 15 to 19 years, this pattern is not stable across years. Moreover, even for the two longest marriage-length categories (25–29 years and 20–24 years), the differences between couples where the primary earner works for a large firm and those where the primary earner works for a small to medium-sized firm become smaller in 2009 and 2010. These results may be partly due to the fact that the threshold for distinguishing between small to medium-sized firms and large firms in the Vital Statistics is quite low, with large firms defined as those with 100 or more employees. Thus, "large" firms may include a substantial number of firms that are still comparatively small, and where wages – and hence pension contributions – are not much higher than at firms classified as small to medium-sized firms.

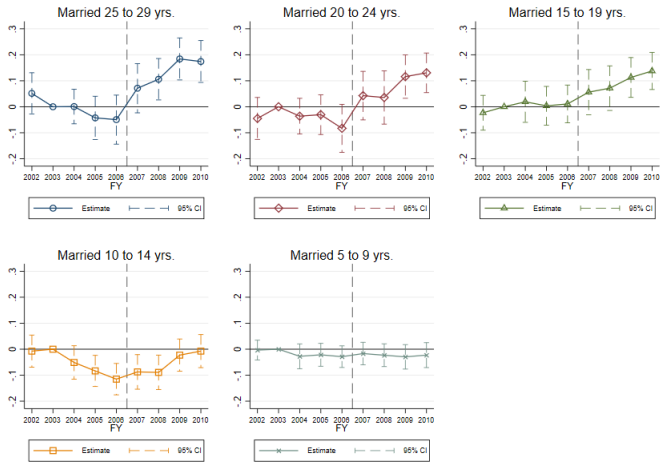
To further assess the validity of our hypothesis, we next examine whether the pattern observed in Figure 7—that longer marriage duration is associated with a greater increase in divorces after the pension reform—is consistent across different firm sizes. The most significant impact is seen among couples whose primary earner was employed by a large firm and whose marriage length was 25–29 years, with divorces increasing by approximately 20% following the reform. These results are consistent with the hypothesis derived from the theoretical model presented in Section 3. In contrast, for couples married for 10 to 14 years, Figures 8(a) and 8(b) show a significant decline in divorces during the period prior to the pension reform. This may indicate that the divorce trend for this group differs from that of couples with shorter marriage lengths (i.e., under five years). If this trend is indeed specific to the 10–14 year group, the triple-differences approach using self-employed and farming households as an additional control group—introduced in Section 6.3—may help to more accurately isolate the effect of the pension reform.

Figure 8: Impact of the pension reform on adjusted divorce incidence by firm size of the primary earner

(a) Large firm employee



(b) Small to medium-sized firm employee



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1yl} in Eq. (15) for divorced couples whose primary earner worked for a large firm (Figure 8(a)) or a small to medium-sized firm (Figure 8(b)), represented by markers in each panel. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. Each panel presents the estimates for couples with a different marriage length (l). Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between couples married for less than 5 years and those married for longer from the reference year FY2003 to the other fiscal years. The number of observations used in each estimation is 3,240. The dashed lines indicate the 95% confidence intervals for the estimates. Standard errors are clustered at the year-month (i.e., divorce date) level.

6.2 Falsification test

If the increase in divorce incidence observed in Figures 7 and 8 in FY2007 is not due to trends specific to couples with long marriage lengths but instead due to the impact of the pension reform, there should be no corresponding increase in divorces among couples with a farming- or self-employed primary earner, who were unaffected by the reform. To test this, we perform the same analysis for couples with a farming- or self-employed primary earner as we did for couples with a firm-employed primary earner as a falsification test.

Before reporting the results of the falsification test, we first repeat the descriptive analysis conducted in Sections 3.1 and 4.3 for couples with a firm-employed primary earner for couples with a farming- or self-employed primary earner. First, Appendix Figure A5 presents the same descriptive distributions as Figure 2, with both figures constructed from the JPSC. Although the sample size for farming or self-employed couples is considerably smaller, the mean and median values of the husband's share in labor income and household work time closely resemble those observed for the salaried couples shown in Figure 2. While this confirms that a traditional division of labor was present in both types of households, unlike salaried couples, farming or self-employed couples were not subject to the new pension division rule. Therefore, their divorce incidence should not exhibit a discrete rise in FY2007.

Second, Appendix Figure A6, based on the Vital Statistics, examines developments in the monthly divorce incidence from FY2002 to FY2010. Except for couples married for 25 to 29 years, there is little evidence of a rise in the divorce incidence in April 2007, even among couples with long marriage lengths.

Third, Appendix Figure A7, also using the Vital Statistics, presents the annual rate of change in the divorce incidence for couples with a farming- or self-employed primary earner. It shows that, except for a slight increase from FY2006 to FY2007 among couples married for 20 years or more, the annual rate of change in divorce incidence shows little variation as the length of marriage increases. The observed increase in the

divorce incidence for couples married for 20 years or more from FY2006 to FY2007, as well as the increase in the divorce incidence among couples married for 25 to 29 years observed in Appendix Figure A6, could potentially be explained by primary earners who retired from salaried employment and subsequently transitioned to farming or self-employment.[26]

Next, we estimate Eq. (15) for couples with a farming- or self-employed primary earner. As shown in Appendix Figure A8, there is no indication of an increase in divorce incidence in FY2007 for couples in any marriage-length category. This finding suggests that the increase in the adjusted divorce incidence observed in Figures 7 and 8 among couples with a firm-employed primary earner was driven by the effects of the pension reform.

It is also worth noting that for the two longest marriage-length categories, there is a slight decrease in the divorce incidence in FY2006, and for couples married for 10 to 14 years divorces declined from FY2004 onward. These trends are consistent with the patterns observed for couples with a firm-employed primary earner and may reflect trends specific to marriage length.

6.3 The effect of the pension reform: Triple-differences estimates

To address potential biases arising from marriage-length-specific trends in divorce incidence, we estimate Eq. (16) under the assumption of parallel pre-trends in the adjusted divorce incidence between couples with a firm-employed primary earner and those with a farming- or self-employed primary earner. The results are presented in

[26] According to the JPSC, among couples classified as farming or self-employed in 2006, the husband had engaged in farming or self-employment for an average of 73.7% of the years they had been married up to that point. This implies that a non-negligible share of these husbands had previously spent substantial periods as salaried workers, making it unsurprising that some may still have been affected by the introduction of the pension division rule. In contrast, among salaried couples in 2006, the husband had been a salaried worker for an average of 95.8% of their married years, suggesting that those identified as salaried workers at that point in time had spent nearly their entire marriage in salaried employment and were thus clearly affected by the reform.

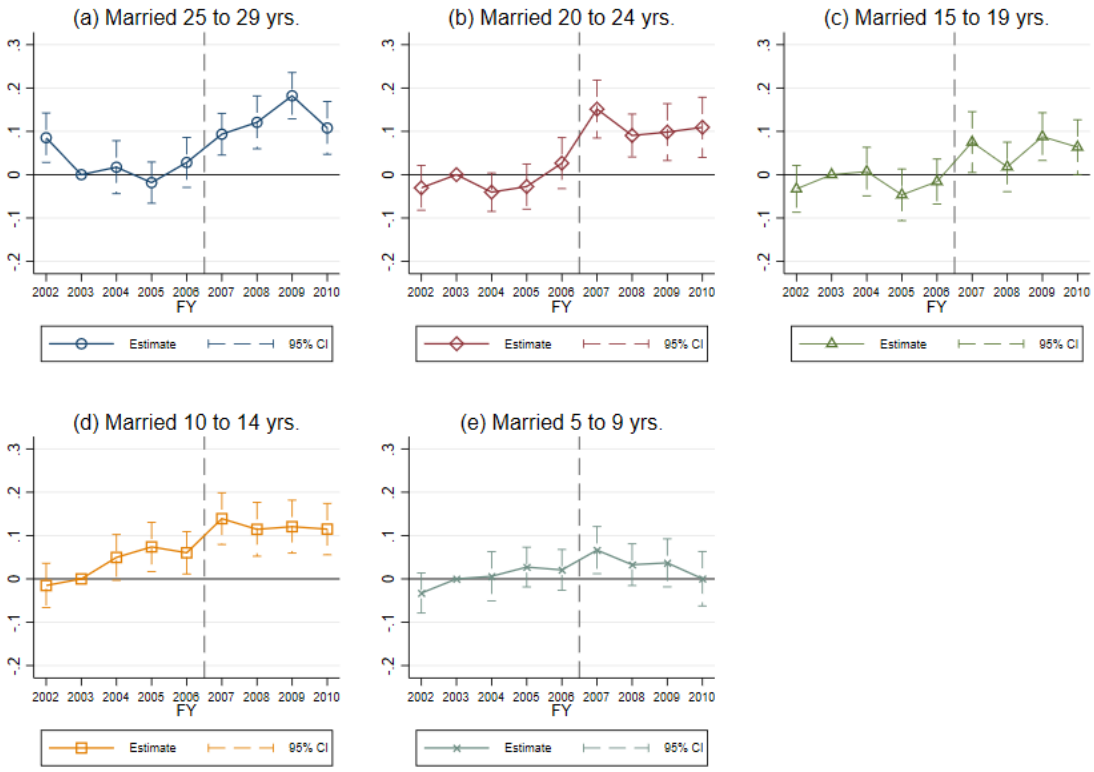
Figure 9. In the estimations for the three longest marriage-length categories, shown in Figures 9(a) to (c), the finding that the divorce incidence increased in FY2007 remains unchanged. Moreover, the declining trend in divorces observed before the pension reform in Figures 7 and 8 is no longer evident in any of the panels. With the exception of couples married for 10 to 14 years, the coefficients for the pre-reform period (i.e., before FY2007) are generally not statistically significant. This suggests that there are no pre-existing trends unique to farming- or self-employed couples, meaning that the key identifying assumption of the triple-differences analysis is not violated.

For couples married for 10 to 14 years, as shown in Figure 9(d), the coefficients for the period from FY2007 onward are significantly positive. However, in contrast to the results for longer marriage lengths, several coefficients for the pre-reform period are also significantly positive, raising concerns that the observed post-reform increases may not be entirely attributable to the pension reform. The figure indicates a discontinuous increase in the divorce incidence between FY2006 and FY2007, followed by a persistently higher level through subsequent years. Therefore, the differences in the coefficients between FY2006 and the post-reform years—0.079 (for FY2007), 0.054 (for FY2008), 0.060 (for FY2009), and 0.055 (for FY2010)—may be interpreted as the effects of the pension reform. The F-test rejects the null hypothesis that the differences in coefficients between FY2006 and each of the subsequent years are equal to zero at conventional significance levels.

6.4 Postponement behavior

The pension division rule may not only have permanently increased the level of divorce incidence but may also have had the effect of postponing divorces. Such behavior may have arisen because the dependent spouse benefited more from divorcing after the reform than before due to the pension benefit transfers they stood to receive from the primary earner under the new pension division rule.

Figure 9: Impact of the pension reform on adjusted divorce incidence: Triple-differences analysis



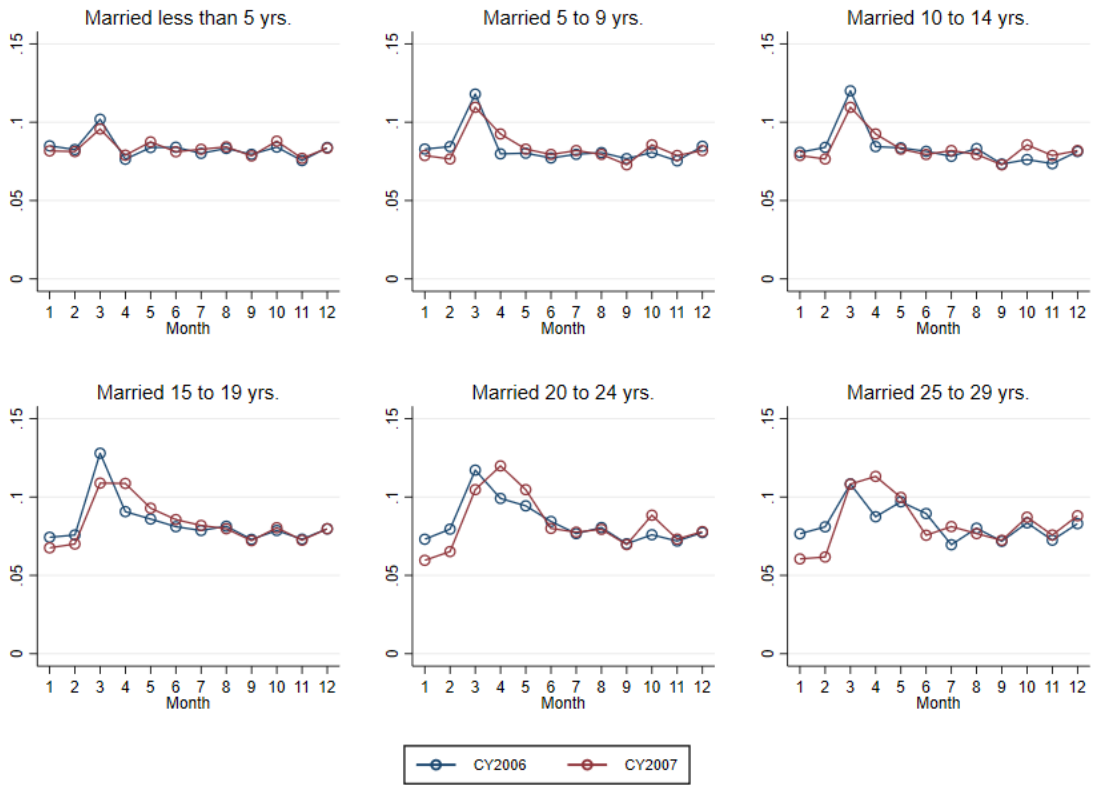
Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1ylo} in Eq. (16) for divorced couples where the primary earner was employed by a firm, represented by markers in each panel. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. Each panel presents the estimates for couples with a different marriage length (l). Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between couples with a farming- or self-employed primary earner and those with a firm-employed primary earner. Specifically, the estimates capture triple differences: changes in the divorce incidence from FY2003 (the reference year) to the other fiscal years, across marriage length groups (less than 5 years versus longer), and between primary earner occupation. The number of observations used in the estimation is 6,480. The dashed line indicates the 95% confidence intervals for the estimates. Standard errors are clustered at the year-month (i.e., divorce date) level.

Such postponement of divorces would have reduced the divorce incidence before the pension reform and increased it afterward. If such an effect on the timing of divorces did occur, our estimates of the effect on the divorce incidence for FY2007 should be higher than for other years. To assess whether such a shift in the timing of divorces actually occurred, we compare the proportion of divorces by month for couples with a firm-employed primary earner between the 2006 and 2007 calendar years. According to Figure 10, the proportion from January to March 2007 is lower than that in 2006 among couples married for 15 years or more, while the proportion in April 2007 is higher than that in 2006. This pattern suggests the possibility of postponement behavior. In contrast, no significant changes are observed in the monthly proportion of divorces for couples with shorter marriage lengths.[27]

Next, to remove the potential increase in divorces due to postponement, we estimate Eq. (15) excluding April data for all years. The estimation results for the longest marriage-length category are presented in Figure 11. As expected, the coefficient estimates for FY2007 are smaller when April data are excluded. Specifically, for couples married for 25 to 29 years, the coefficient for FY2007 decreases by 16.5%, from 0.120 to 0.103. Similarly, the coefficients for couples married for 20 to 24 years and 15 to 19 years decrease by 21.6% and 23.0%, respectively (see Appendix Figure A9). For all other years, the coefficients change little for these marriage-length groups. Therefore, while the increase in divorces due to postponement is indeed reflected in the coefficient β_{1yl} in Eq. (15), its contribution is at most around 20%. Furthermore, this contribution of 20% represents an upper bound, as the increase in divorces in April 2007 was not solely due to postponement but also included divorces initiated

[27] Among couples married for 5–10 years and 10–14 years, there is also a slight tendency for the proportion of divorces in April 2007 to be higher than that in April 2006. Since homemakers in these groups would still have benefited from pension transfers upon divorce to some extent, it is plausible that some who were already planning to divorce regardless of the reform chose to postpone. However, among these shorter-marriage couples, the impact of the pension reform was likely insufficient to prompt homemakers who would not have otherwise considered divorce to do so. Thus, for shorter-married couples, it is likely that the only effect of the reform may have been that it potentially led to the postponement of some divorces, without any notable permanent increase in the incidence of divorce.

Figure 10: Proportion of divorces by month



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure shows the monthly proportion of divorces by marriage length among couples where the primary earner was employed by a firm. The navy and red lines represent the proportions for the calendar years 2006 and 2007, respectively.

by dependent spouses who would not have been able to divorce without the new pension division rule—that is, divorces primarily driven by the loss of marital gains from the division of labor, which is the main focus of this study. Thus, the actual impact of postponement is likely to have been even smaller. This suggests that the primary driver of the overall increase in the divorce incidence in FY2007 was the loss of marital gains from the division of labor rather than a shift in timing.

Finally, we consider potential reasons for the limited evidence of postponement behavior. One possible reason is that postponement was relevant only for couples who would have divorced even without the pension reform, so that the reform provided little additional incentive to delay the decision. Those who would have divorced irrespective of the reform likely typically were dependent spouses for whom financial insecurity in old age was not a substantial barrier to divorce. Specifically, these individuals likely included those who could rely on financial support from their parents, expected *inter vivos* gifts or inheritances, or were compelled to divorce for urgent reasons such as domestic violence. As a result, they were less likely to perceive significant financial benefits from the reform.

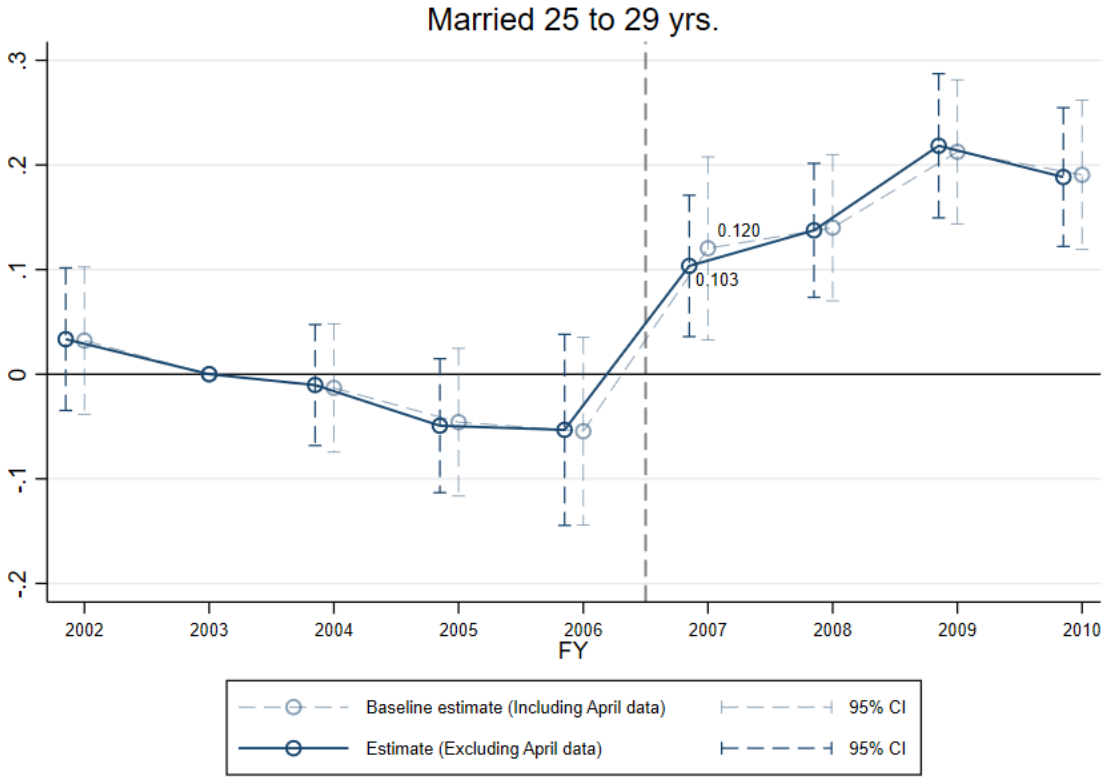
6.5 Heterogeneity analysis

This section examines whether the impact of the new pension division rule on divorce decisions varied across different household characteristics. Specifically, we examine heterogeneity based on the presence of minor children, the couple's place of residence at the time of divorce (urban vs. rural), and the pre-divorce employment status of the husband and wife.

Presence of minor children and urban–rural residence

Table 2 reports the results of the DID and triple-differences analyses, conducted separately based on whether minor children were present (upper panel) and by urban or rural residence (lower panel). To address potential sensitivity to the choice of reference

Figure 11: Impact of the pension reform on adjusted divorce incidence: Excluding April data



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1yl} from Eq. (15) for couples married for 25 to 29 years when April data are excluded for all years. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. The estimation focuses on couples where the primary earner was employed by a firm. Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between couples married for less than 5 years and those married for longer from the reference year FY2003 to the other fiscal years. The number of observations used in the estimation is 3,240. The dashed lines indicate the 95% confidence intervals for the estimates. Standard errors are clustered at the year-month (i.e., divorce date) level.

year, as observed in Figures 7 and 8, and to reduce the number of figures, we estimate modified versions of Eqs. (15) and (16), replacing the variable $Year(y)$ with a dummy variable, $Post$, which takes a value of 1 for FY2007 and later.

We begin by examining the estimation results based on the presence of minor children. Columns (2) and (3) of Table 2 report the estimated coefficients on the interaction terms for couples with and without minor children at the time of divorce, respectively.[28] In both the DID and triple-differences estimations, the effect of the pension reform on divorce is larger for couples without minor children.[29] This result suggests that in the absence of minor children, couples may face fewer constraints in deciding to divorce, such as delaying divorce until children reach adulthood.

Notably, regardless of whether minor children are present, longer-married couples show a larger increase in divorces after the pension reform, particularly in the DID estimates. This finding implies that the greater increase in divorces observed for longer-married couples in Figures 7 and 8 is not merely due to their lower likelihood of having minor children and thus facing fewer constraints on divorce timing. Rather, it suggests that the stronger effect of the pension reform on these couples reflects the higher cumulative pension contributions made by primary earners over a longer marriage, making the impact of the new pension division rule more substantial for them.

Next, we examine whether the effect of the pension reform varies based on couples' place of residence at the time of divorce (i.e., urban versus rural). To do so, we categorize Japan's 47 prefectures into urban ones, consisting of Tokyo, Kanagawa, Chiba, Saitama, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka prefectures, and rural ones, comprising all other prefectures. Since a higher proportion of primary earners in

[28]The number of observations for the triple-differences estimation among couples with minor children is 6,479, which is one fewer than in the other estimations. This is because splitting the sample resulted in a cell where the number of divorces was zero.

[29]In the DID estimation, the coefficients for shorter-married couples with minor children are significantly negative. This likely reflects the declining trend in divorces observed among couples married for 10–14 years in Figures 7 and 8, which began before the pension reform. The fact that the interaction term is also significantly negative for couples married for 5–9 years may similarly indicate a declining trend for this group.

Table 2: Heterogeneity analysis: Presence of minor children and urban-rural residence

Dependent variable: Natural log of the adjusted divorce incidence	**DID**			
	With children	Without children	Urban	Rural
	Coef.	Coef.	Coef.	Coef.
Length 25-29×*Post*	0.140***	0.194***	0.181***	0.184***
	(0.032)	(0.018)	(0.022)	(0.020)
Length 20-24×*Post*	0.097***	0.240***	0.158***	0.127***
	(0.028)	(0.019)	(0.023)	(0.024)
Length 15-19×*Post*	0.062***	0.200***	0.099***	0.089***
	(0.022)	(0.024)	(0.022)	(0.021)
Length 10-14×*Post*	-0.044**	0.110***	-0.014	0.018
	(0.018)	(0.012)	(0.017)	(0.017)
Length 5-9×*Post*	-0.046***	0.051***	-0.023*	0.011
	(0.015)	(0.011)	(0.014)	(0.012)
Number of obs.	3,240	3,240	3,240	3,240
Within R-sq.	0.0647	0.0939	0.1307	0.0908
Dependent variable: Natural log of the adjusted divorce incidence	**Triple differences**			
	With children	Without children	Urban	Rural
	Coef.	Coef.	Coef.	Coef.
Length 25-29×*Post* × *Firm*	0.079**	0.136***	0.118***	0.091***
	(0.038)	(0.021)	(0.025)	(0.023)
Length 20-24×*Post* × *Firm*	0.097***	0.178***	0.123***	0.133***
	(0.022)	(0.026)	(0.023)	(0.020)
Length 15-19×*Post* × *Firm*	0.057***	0.092**	0.070***	0.087***
	(0.018)	(0.035)	(0.020)	(0.022)
Length 10-14×*Post* × *Firm*	0.058***	0.134***	0.092***	0.088***
	(0.020)	(0.024)	(0.021)	(0.017)
Length 5-9×*Post* × *Firm*	0.026	0.003	0.022	0.042***
	(0.016)	(0.019)	(0.019)	(0.014)
Number of obs.	6,479	6,480	6,480	6,480
Within R-sq.	0.5077	0.4388	0.5341	0.5658

Notes: Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The upper panel reports estimates of β_{1yl} from Eq. (15), while the lower panel reports estimates of β_{1ylo} from Eq. (16), where the variable $Year(y)$ is replaced with dummy variable *Post*, which equals 1 for FY2007 and later. The estimation focuses on couples where the primary earner was employed by a firm, split into those with and without minor children and those residing in urban and rural areas, where urban areas consist of Tokyo, Kanagawa, Chiba, Saitama, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka prefectures, while rural areas consist of all other prefectures. Both estimations control for year-month and marriage-length fixed effects. In the lower panel, we further control for fixed effects for the occupation of the primary earner. Cluster-robust standard errors are reported in parentheses, with clustering at the year-month (i.e., divorce date) level.

urban areas are employed by large firms, we would expect the impact of the pension reform to be larger in urban areas. However, as shown in columns (4) and (5) of Table 2, contrary to this expectation, the estimation results reveal little difference between urban and rural areas. One possible explanation is that the higher cost of living in urban areas — particularly housing costs such as rent — makes it more difficult for dependent spouses to fully resolve financial insecurity in old age, even when utilizing the new pension division rule.

Employment status of each spouse

Section 6 showed that couples where the husband made larger pension contributions during the marriage experienced a greater increase in the divorce incidence following the pension reform. However, the greater increase in divorces among such couples following the pension reform could potentially also reflect other household characteristics. Such characteristics include (i) whether the dependent spouse is able to earn income by working after divorce; (ii) whether the dependent spouse can expect to receive financial support (or *inter vivos* gifts or inheritances) from parents or relatives after divorce; and (iii) whether the couple accumulated a large amount of assets during the marriage (assuming that half of these assets are transferred to the dependent spouse through property division upon divorce). In other words, whether the dependent spouse has additional financial means aside from pension benefits is also likely to determine how easy or difficult it is to pursue divorce. Among these three factors, the Vital Statistics data do not contain information needed to analyze (ii) and (iii); however, for (i), we can use the pre-divorce employment status of the husband and wife based on information recorded at the time of divorce to divide our sample.

The upper and lower panels of Table 3 present the results of the DID and triple-differences analyses, respectively, conducted separately for couples in which only the husband was employed (column (2)) and those in which both spouses were employed (column (3)). Since information on the employment status of both spouses at the time

of divorce is available only for couples who divorced in fiscal years when the Population Census was conducted (which occurs every five years in Japan), the estimations in this table use data exclusively from FY2005 and FY2010. Accordingly, the number of observations is 720 (= 2 years × 12 months × 30 marriage length categories) for the DID analysis, while for the triple-differences analysis this number doubles to 1,440 due to the inclusion of two primary earner occupation categories. Aside from the smaller sample due to these data limitations, the estimations in Table 3 follow the same approach as those in Table 2.

Before analyzing the heterogeneity by employment status, we estimate Eq. (15) and Eq. (16) using data for the two Census years without splitting the sample. This allows for a direct comparison with the earlier findings based on the full observation period. The results are shown in the column labeled "All" in Table 3. For both estimation methods, they exhibit a similar pattern to those in the previous analyses—namely, that divorces increased after the pension reform, particularly among couples with longer marriage durations.

When the sample is divided by employment status, the increase in divorces following the pension reform is found to be larger among couples in which both spouses were employed, compared to those in which only the husband was employed. Since pension benefits received by wives—even after pension division upon divorce—are generally insufficient to fully cover living expenses in old age, this finding is consistent with the notion that continued employment is important for dependent spouses after divorce. Although working wives are often engaged in non-regular employment or earn relatively low incomes (as shown in Figure 2(a)), being employed still enables them to supplement their pension benefits, thereby making divorce a more viable option.[30]

[30]In Japan, wives are typically younger than their husbands—by an average of about 2.7 years among couples who divorced between FY2007 and FY2010. This age difference may allow them to compensate for their lower annual earnings (often due to non-regular employment) by working for more years and thereby supplementing their pension benefits.

Table 3: Heterogeneity analysis of divorced couples by pre-divorce employment status of husband and wife

Dependent variable: Natural log of the adjusted divorce incidence	**DID**		
	All	H: Working W: Not working	H: Working W: Working
	Coef.	Coef.	Coef.
Length 25-29×*Post*	0.238***	0.121**	0.244***
	(0.034)	(0.047)	(0.042)
Length 20-24×*Post*	0.171***	0.116*	0.152***
	(0.042)	(0.060)	(0.045)
Length 15-19×*Post*	0.119**	0.065	0.096*
	(0.043)	(0.044)	(0.048)
Length 10-14×*Post*	0.070**	-0.0002	0.075**
	(0.031)	(0.040)	(0.030)
Length 5-9×*Post*	-0.007	-0.030	-0.012
	(0.027)	(0.037)	(0.024)
Number of obs.	720	720	720
Within R-sq.	0.2454	0.0415	0.1800
Dependent variable: Natural log of the adjusted divorce incidence	**Triple differences**		
	All	H: Working W: Not working	H: Working W: Working
	Coef.	Coef.	Coef.
Length 25-29×*Post*	0.127***	0.069	0.181***
	(0.030)	(0.058)	(0.036)
Length 20-24×*Post*	0.138***	0.113	0.182***
	(0.036)	(0.074)	(0.046)
Length 15-19×*Post*	0.111***	0.131**	0.120***
	(0.033)	(0.062)	(0.036)
Length 10-14×*Post*	0.040	-0.029	0.083**
	(0.030)	(0.044)	(0.032)
Length 5-9×*Post*	-0.026	-0.003	-0.006
	(0.027)	(0.040)	(0.037)
Number of obs.	1,440	1,440	1,440
Within R-sq.	0.7003	0.3916	0.6835

Notes: Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The table reports estimates of β_{1yl} from Eq. (15) in the upper panel and β_{1ylo} from Eq. (16) in the lower panel, using data for FY2005 and FY2010. The estimations are conducted after replacing the variable $Year(y)$ with dummy variable $Post$, which equals 1 for FY2010, for couples in which the primary earner was employed by a firm, categorized by the pre-divorce employment status of the husband and wife. "H" stands for "Husband," and "W" stands for "Wife." Both estimations control for year-month and marriage-length fixed effects. In the lower panel, we further control for fixed effects for the occupation of the primary earner. Cluster-robust standard errors are reported in parentheses, with clustering at the year-month (i.e., divorce date) level.

6.6 Robustness checks

In this section, we check the robustness of the results by conducting estimations using the number of divorces rather than the adjusted divorce incidence as the dependent variable, and by changing the clustering level for standard errors. Annual changes in the number of divorces are influenced by demographic shifts, which can complicate the identification of the effects of the pension reform. However, this approach allows us to include couples married for 30 years or more, for whom the adjusted divorce incidence can only be calculated for part of the observation period. Since the proportion of couples who divided their pension contributions under the new pension division rule after 2007 is higher among those with longer marriage lengths, as shown earlier in Appendix Figure A2, we expect to observe a greater effect of the pension reform for these couples.

We start by estimating Eq. (15)—after replacing the variable $Year(y)$ with dummy variable $Post$, which equals 1 for FY2007 and later—using the natural log of the number of divorces as the dependent variable.[31] The results, presented in column (1) of Appendix Table A4, indicate that the number of divorces increased significantly in FY2007 except for couples married for 30 to 34 years and 5 to 9 years. Similarly, column (2) shows the estimation results obtained after applying the same modification to Eq. (16). These results indicate that, in FY2007, the number of divorces increased more substantially among couples with longer marriage durations. In particular, divorces among couples married for 30 years or more increased by approximately 14%. The fact that in this estimation the increase in divorces among couples married for 30-34 years now is also statistically significant may be due to the removal of marriage-length-specific divorce trends via the triple-differences estimation.

Next, we also estimate Eqs. (15) and (16) with clustering not only by the date of divorce but also by marriage length. This approach accounts for correlations in

[31]The sample size for the DID estimation is 4,320 (= 9 years × 12 months × 40 categories of marriage length). Likewise, the sample size for the triple-differences estimation, which will be explained below, is 8,640 (= 9 years × 12 months × 40 categories of marriage length × 2 categories of the primary earner's occupation).

divorces among couples with the same marriage length at a given time, as well as potential serial correlation. The significance levels of the coefficients remain largely unchanged (results not shown to conserve space).

7 Conclusion

This study used Japan's 2007 pension reform as a natural experiment to investigate whether the loss of marital gains from the division of labor for dependent spouses increases the likelihood of divorce. For couples in which one spouse is the primary earner, providing all of the household's labor income, and the other spouse is a full-time homemaker, the reform allows for the transfer of up to 50% of the primary earner's pension benefits to the dependent spouse upon divorce. If this reform reduces the dependent spouse's economic insecurity in old age, the spouse may no longer need to remain married solely to benefit from the division of labor—that is, to exchange household work for the primary earner's pension income. This change enables spouses who may have otherwise stayed in the marriage for financial reasons to pursue divorce without sacrificing their post-retirement financial security. Theoretical analysis suggests that the reform potentially creates an incentive for dependent spouses to divorce, particularly in cases where the primary earner made larger pension contributions (resulting in larger pension benefits subject to division).

Finally, our findings offer broader insights into the evolving dynamics of marriage and divorce in contemporary Japan. First, they suggest that the division of labor between spouses constitutes an important source of marital gains, and that the loss of these gains increases the likelihood of divorce. This may help explain, at least in part, the long-term decline in marriage rates in Japan, as traditional gender roles—in which men engage in market work and women focus on household work—continue to erode. Moreover, the increasing substitution of household production (e.g., cooking, cleaning, and laundry) with market-based goods and services may further reduce the attractiveness of marriage by diminishing the benefits of the division of labor. Second,

our results suggest that before the pension reform, many dependent spouses may have refrained from divorcing due to financial insecurity. As a result, they may have lacked the ability to credibly threaten divorce, which may have weakened their bargaining power within marriage. By improving their financial prospects after divorce, the reform may have contributed to the welfare of these spouses, either by enabling them to exit unsatisfactory marriages or by allowing them to credibly threaten divorce.

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Empirical Appendix

Table A1: Distribution of the proportion of pension entitlements allocated to dependent spouses

	%<10	10≤%<20	20≤%<30	30≤%<40	40≤%<50	50%
FY2007	0.1	0.2	0.9	2.4	4.6	91.9
FY2008	0.1	0.1	0.7	2.0	3.3	93.8
FY2009	0.0	0.2	0.7	2.0	3.1	94.0
FY2010	0.0	0.1	0.6	1.7	3.0	94.5

Notes: Data are from the Overview of Social Insurance Services (Social Insurance Agency). The table shows the distribution of the proportion of pension entitlements allocated to dependent spouses upon divorce. The figures indicate the percentage of divorced couples falling into each category, for FY2007 to FY2010.

Table A2: Proportion of divorced couples by length of marriage

FY	Less than 5 yrs.	5 to 9 yrs.	10 to 14 yrs.	15 to 19 yrs.	20 to 24 yrs.	25 to 29 yrs.	30 yrs. or more	N.A.
2002	0.317	0.226	0.138	0.092	0.070	0.053	0.057	0.048
2003	0.313	0.225	0.141	0.092	0.072	0.050	0.060	0.048
2004	0.317	0.222	0.139	0.093	0.071	0.047	0.060	0.052
2005	0.316	0.225	0.137	0.095	0.071	0.045	0.061	0.050
2006	0.317	0.231	0.138	0.092	0.067	0.043	0.059	0.053
2007	0.309	0.226	0.135	0.095	0.069	0.047	0.065	0.054
2008	0.305	0.222	0.137	0.098	0.068	0.047	0.062	0.060
2009	0.305	0.215	0.136	0.099	0.069	0.048	0.065	0.062
2010	0.301	0.214	0.141	0.103	0.070	0.048	0.066	0.058

Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The table reports the proportion of divorced couples by length of marriage for calendar years from 2002 to 2010.

Table A3: Descriptive statistics by primary earners' occupation among divorced couples

FY	N	Farmers or self-employed			
		Mean	S.D.	Min.	Max.
2002	360	0.000183	0.000071	0.000043	0.000344
2003	360	0.000177	0.000068	0.000054	0.000324
2004	360	0.000162	0.000061	0.000043	0.000309
2005	360	0.000161	0.000061	0.000045	0.000310
2006	360	0.000151	0.000059	0.000036	0.000294
2007	360	0.000149	0.000057	0.000041	0.000294
2008	360	0.000143	0.000055	0.000039	0.000295
2009	360	0.000142	0.000053	0.000033	0.000310
2010	360	0.000144	0.000052	0.000042	0.000258
FY	**N**	**Working for small to medium-sized firms**			
		Mean	S.D.	Min.	Max.
2002	360	0.000388	0.000266	0.000057	0.001049
2003	360	0.000378	0.000257	0.000043	0.001034
2004	360	0.000358	0.000243	0.000053	0.000929
2005	360	0.000376	0.000258	0.000053	0.001046
2006	360	0.000354	0.000244	0.000044	0.000913
2007	360	0.000355	0.000234	0.000035	0.000916
2008	360	0.000349	0.000230	0.000044	0.000964
2009	360	0.000346	0.000220	0.000060	0.000985
2010	360	0.000356	0.000222	0.000056	0.000896
FY	**N**	**Working for large firms**			
		Mean	S.D.	Min.	Max.
2002	360	0.000257	0.000166	0.000037	0.000614
2003	360	0.000253	0.000162	0.000030	0.000709
2004	360	0.000243	0.000156	0.000034	0.000654
2005	360	0.000260	0.000168	0.000036	0.000720
2006	360	0.000243	0.000160	0.000030	0.000683
2007	360	0.000255	0.000152	0.000042	0.000666
2008	360	0.000252	0.000151	0.000039	0.000696
2009	360	0.000251	0.000149	0.000047	0.000673
2010	360	0.000263	0.000152	0.000042	0.000662

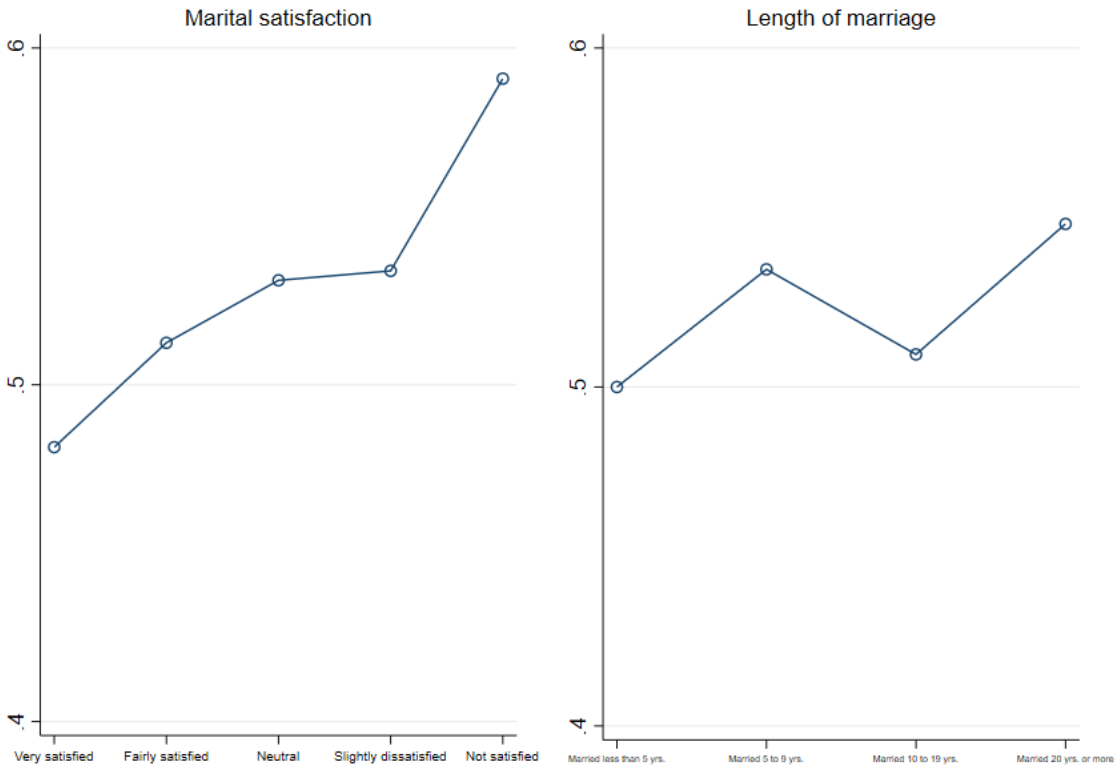
Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The table reports the mean, standard deviation (S.D.), minimum (Min.), and maximum (Max.) values of the adjusted divorce incidence for each fiscal year. "FY" and "N" refer to the fiscal year and number of observations, respectively.

Table A4: DID and triple-differences estimates based on the number of divorces

Dependent variable: Natural log of the number of divorces	(1) **DID**	(2) **Triple differences**
	Coef.	Coef.
Length 35-39×*Post*	0.400***	-
	(0.027)	
Length 30-34×*Post*	0.005	-
	(0.021)	
Length 25-29×*Post*	0.095***	-
	(0.021)	
Length 20-24×*Post*	0.082***	-
	(0.022)	
Length 15-19×*Post*	0.140***	-
	(0.021)	
Length 10-14×*Post*	0.072***	-
	(0.016)	
Length 5-9×*Post*	0.018	-
	(0.012)	
Length 35-39×*Post* × *Firm*	-	0.139***
		(0.030)
Length 30-34×*Post* × *Firm*	-	0.141***
		(0.025)
Length 25-29×*Post* × *Firm*	-	0.105***
		(0.015)
Length 20-24×*Post* × *Firm*	-	0.127***
		(0.016)
Length 15-19×*Post* × *Firm*	-	0.079***
		(0.015)
Length 10-14×*Post* × *Firm*	-	0.089***
		(0.014)
Length 5-9×*Post* × *Firm*	-	0.030**
		(0.022)
Number of obs.	4,320	8,640
Within R-sq.	0.1928	0.6880

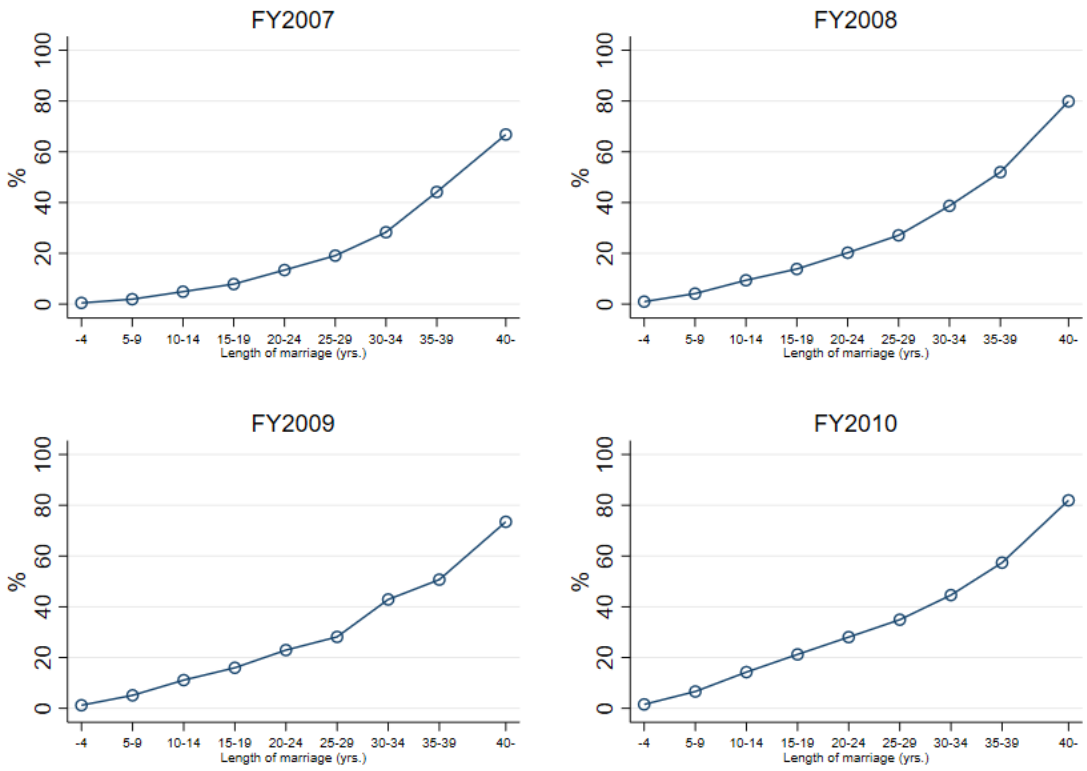
Notes: Significance levels: *** $p<0.01$, ** $p<0.05$. Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The table reports the estimates of β_{1yl} from Eq. (15) in column (1) and those of β_{1ylo} from Eq. (16), where the variable $Year(y)$ is replaced with dummy variable *Post* that equals 1 for FY2007 and later, for couples where the primary earner was employed by a firm. Both estimations control for year-month and marriage-length fixed effects; in column (2), we additionally control for fixed effects for the occupation of the primary earner. Cluster-robust standard errors are reported in parentheses, with clustering at the year-month (i.e., divorce date) level.

Figure A1: Proportion of JPSC respondents aware of the pension division rule upon divorce



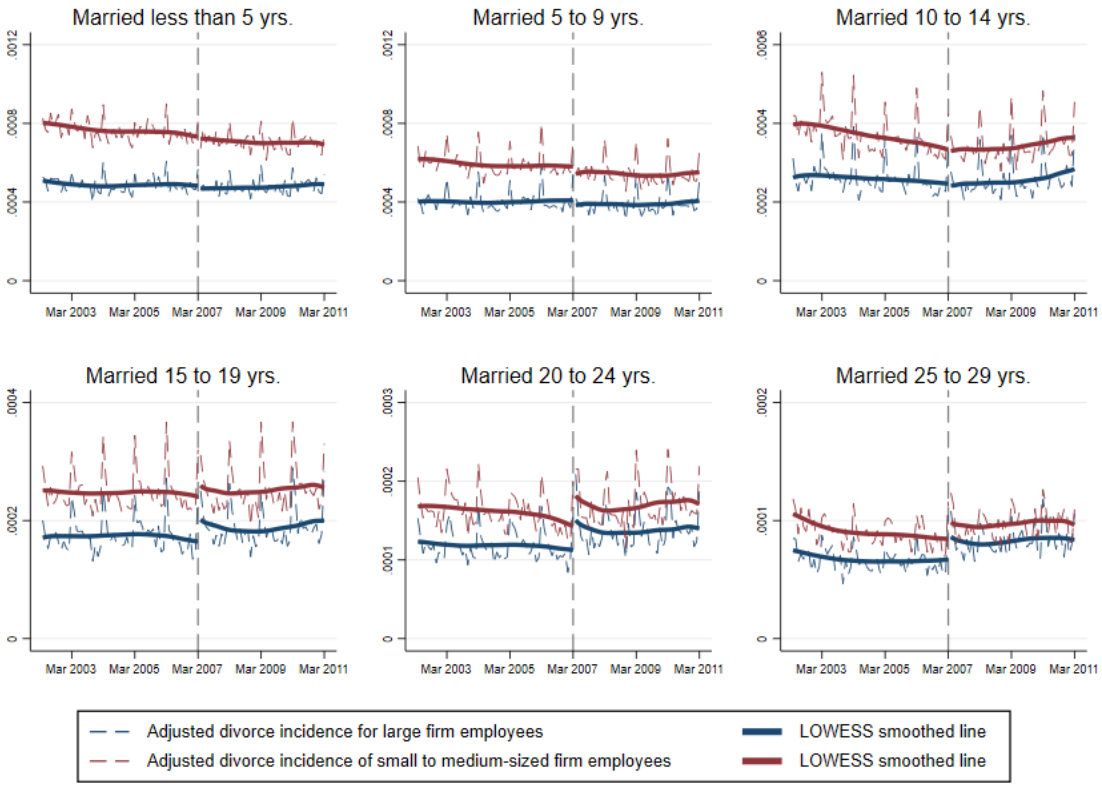
Notes: Data are from the Japanese Panel Survey of Consumers (JPSC), conducted by the Panel Data Research Center at Keio University. This figure shows the proportion of JPSC respondents who were aware of the pension division rule upon divorce in October 2007. Respondents were classified as aware if they answered either "1. Know very well" or "2. Know" from the following four options: "1. Know very well," "2. Know," "3. Slightly know," and "4. Do not know at all." Panels (a) and (b) report this proportion by respondents' marital satisfaction and length of marriage, respectively.

Figure A2: Proportion of divorced couples who divided their pension entitlements under the new pension division rule



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare) and the Overview of Social Insurance Services (Social Insurance Agency). This figure shows, by fiscal year, the proportion of divorced couples who divided their pension entitlements under the new pension division rule. The proportion is presented by marriage length category on the horizontal axis of each panel, in 5-year intervals, with couples married for 40 years or more grouped together.

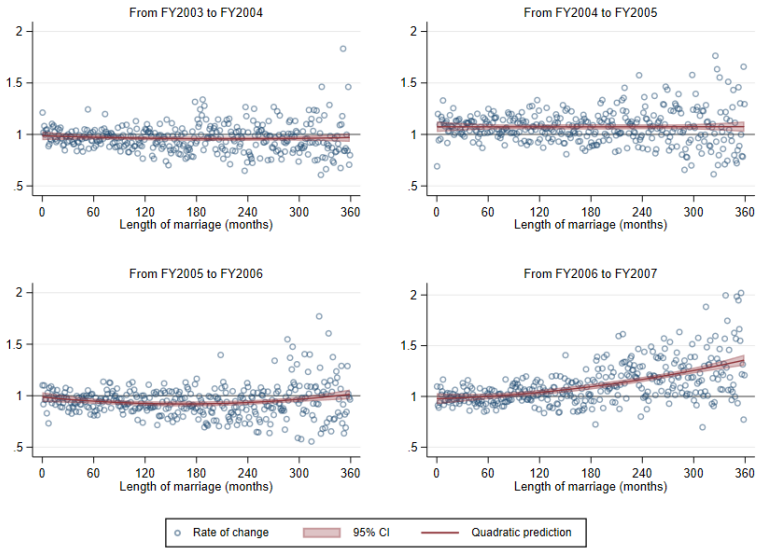
Figure A3: Monthly developments in the adjusted divorce incidence by firm size of the primary earner



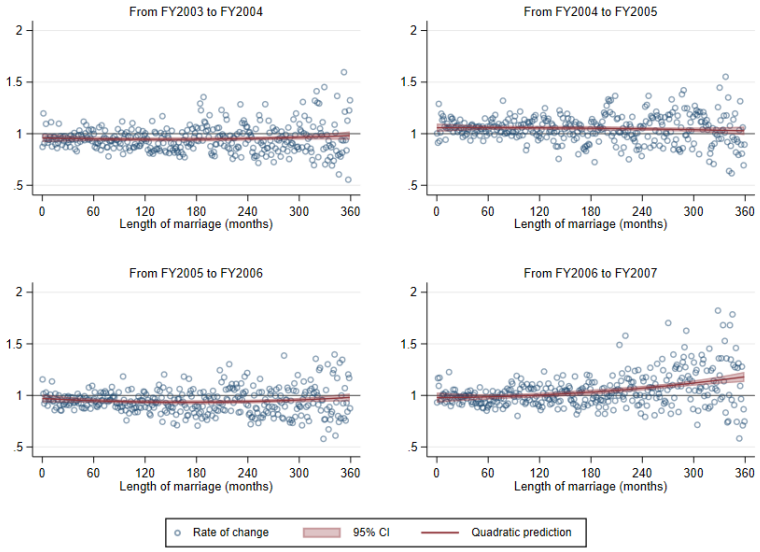
Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The dashed lines represent monthly developments in the adjusted divorce incidence from FY2002 to FY2010, while the bold solid lines represent locally weighted scatterplot smoothing (LOWESS), applied separately to the periods before and after the pension reform. The navy and red lines show monthly developments in the adjusted divorce incidence for couples where the primary earner was employed by a large firm and a small to medium-sized firm, respectively.

Figure A4: Annual rates of change in the adjusted divorce incidence by firm size of the primary earner

(a) Large firm employees



(b) Small to medium-sized firm employees



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure shows the annual rates of change in the adjusted divorce incidence (vertical axis) for couples in which the primary earner was employed by a large firm (A4(a)) or a small to medium-sized firm (A4(b)), categorized by marriage length in months (horizontal axis). The red curves plot the quadratic predictions of the relationship, with the shaded light red areas indicating the 95% confidence intervals.

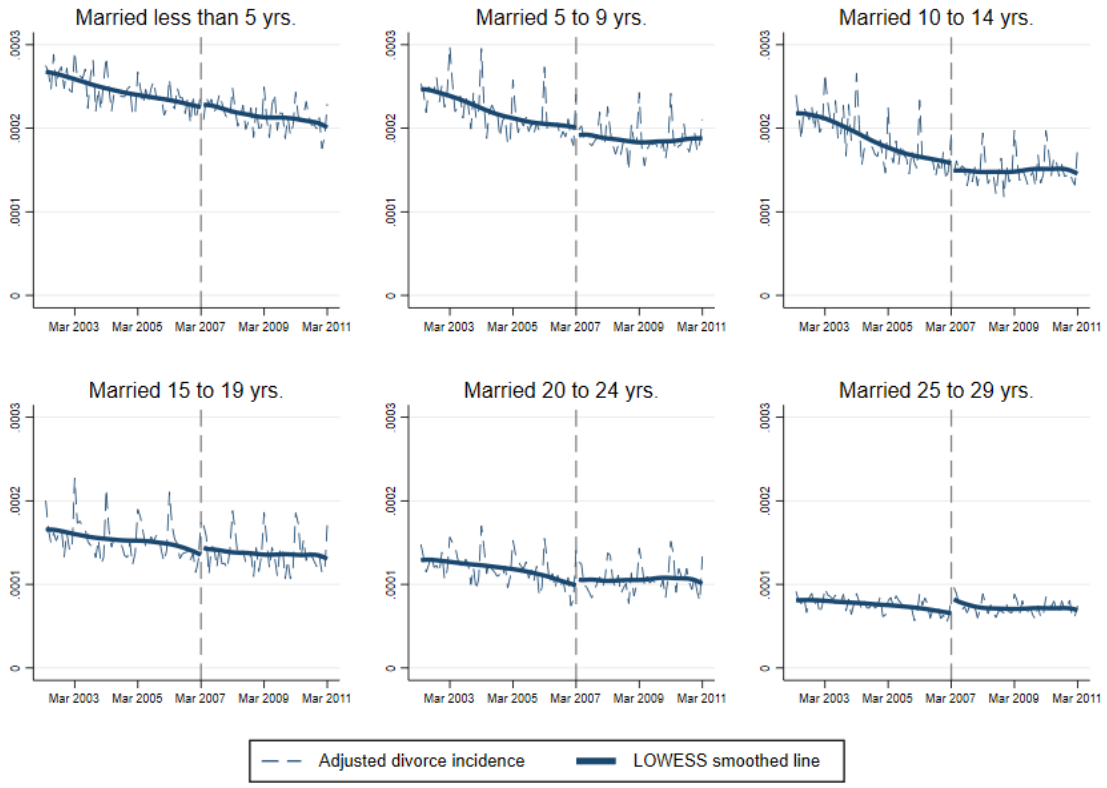
Figure A5: Distribution of husband's share in labor income and household work time of farming and self-employed couples

(a) Husband's labor income share

(b) Husband's household work time share

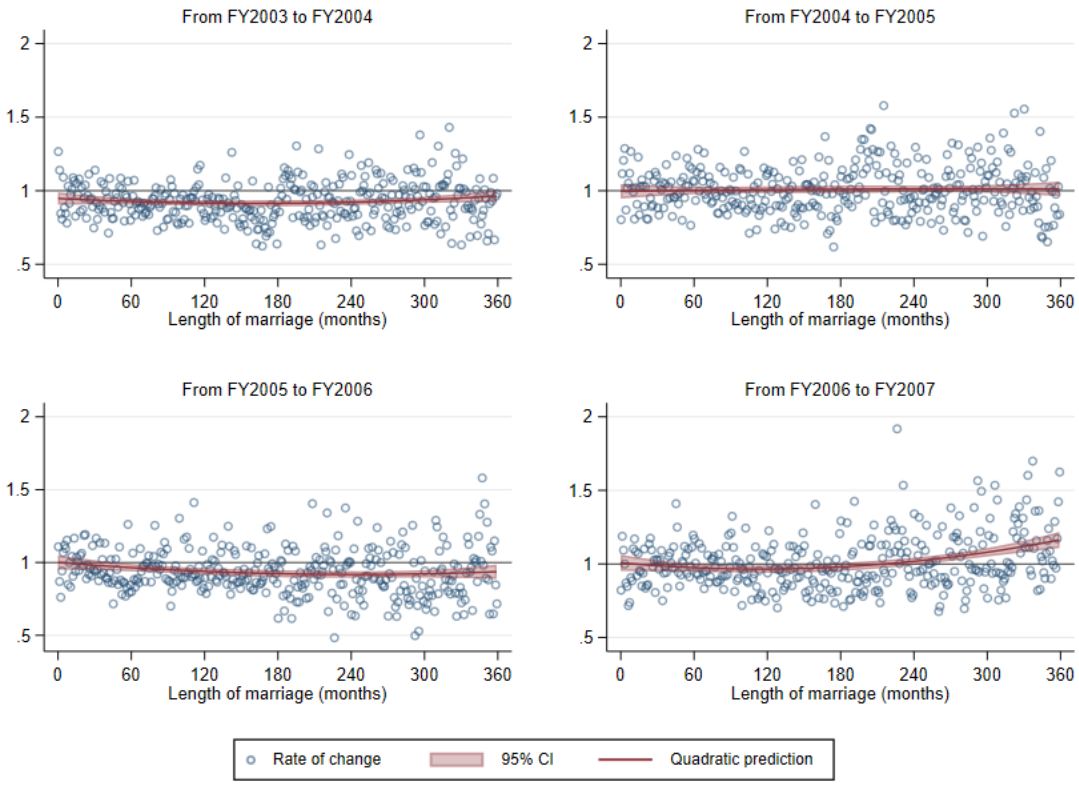
Notes: Based on data from the Japanese Panel Survey of Consumers (JPSC), conducted by the Panel Data Research Center at Keio University. This figure depicts the distribution of the husband's share of labor income among JPSC couples. The sample is restricted to couples who, as of 2006, had at least one farming or self-employed worker (i.e., not a salaried worker) and for whom self-employment income accounted for 50% or more of their total labor income. For these couples, the husband's labor income (household work time) share is calculated as the share of the husband's cumulative labor income (household work time) in the couple's cumulative labor income earned (time spent on household work) during marriage prior to the reform (i.e., prior to 2007).

Figure A6: Monthly developments in the adjusted divorce incidence of couples with a farming- or self-employed primary earner



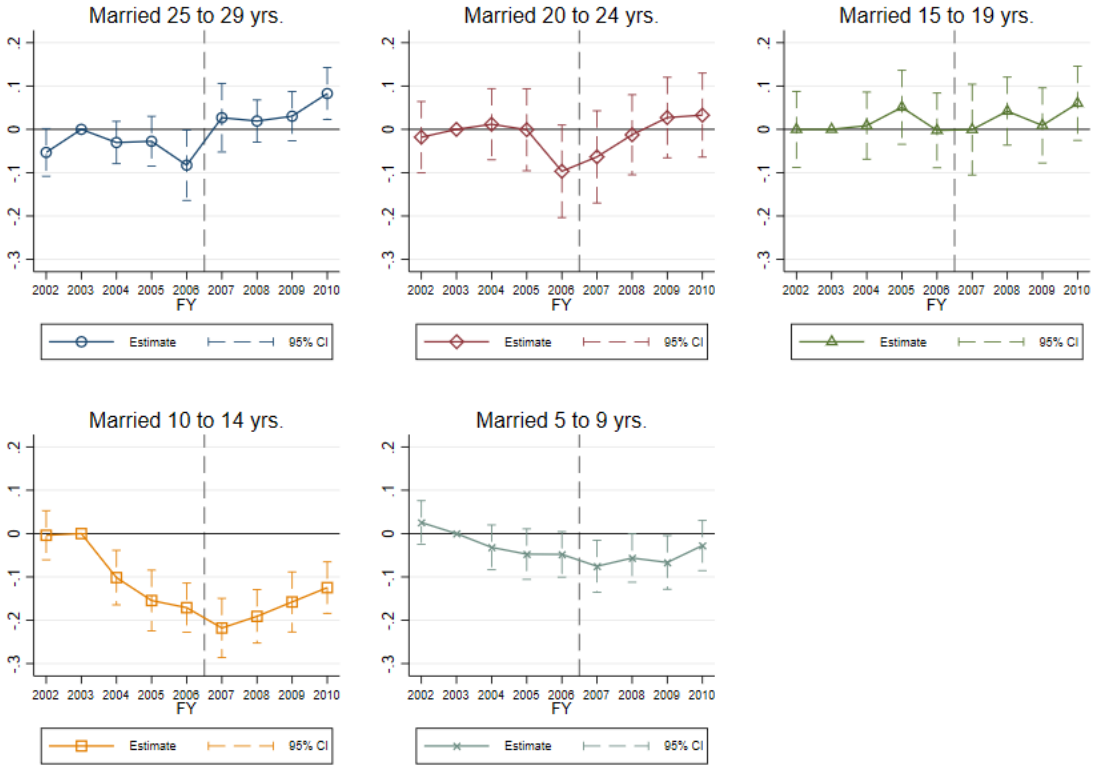
Notes: The data source is the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). The dashed lines represent the monthly developments in the adjusted divorce incidence from FY2002 to FY2010, while the bold solid lines represent locally weighted scatterplot smoothing (LOWESS), applied separately to the periods before and after the pension reform. This figure focuses on couples with a farming- or self-employed primary earner.

Figure A7: Annual rates of change in the adjusted divorce incidence of couples with a farming- or self-employed primary earner



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure shows the annual rates of change in the adjusted divorce incidence (vertical axis) for couples with a farming- or self-employed primary earner, categorized by marriage length in months (horizontal axis). The red curves plot the quadratic predictions of the relationship, with the shaded light red areas indicating the 95% confidence intervals.

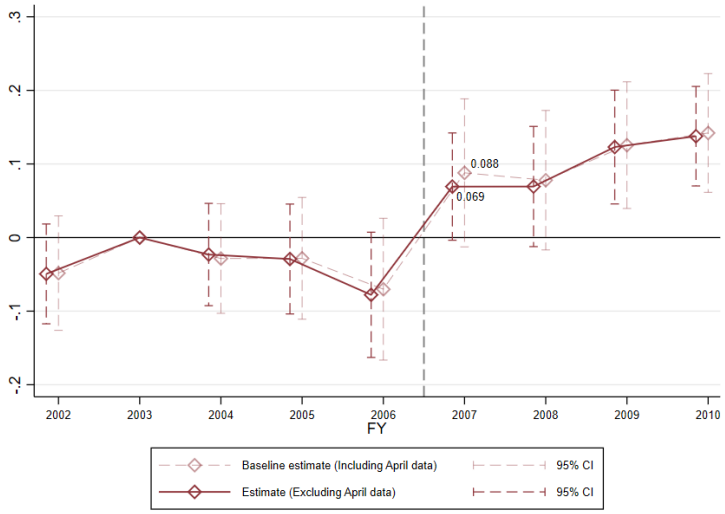
Figure A8: Impact of the pension reform on the adjusted divorce incidence of couples with a farming- or self-employed primary earner



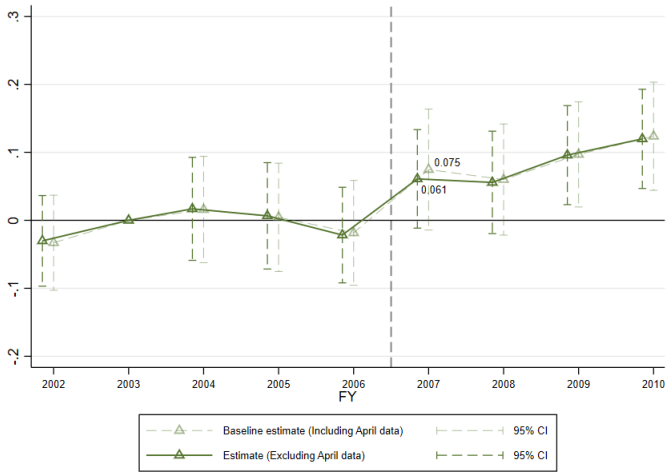
Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1yl} in Eq. (15) for couples with a farming- or self-employed primary earner, represented by the square markers in each panel. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. Each panel presents the estimates for couples with a different marriage length (l). Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between divorced couples married for less than 5 years and those married for longer from the reference year FY2003 to the other fiscal years. The number of observations used in the estimation is 3,240. The dashed lines indicate the 95% confidence intervals. Standard errors are clustered at the year-month (i.e., divorce date) level.

Figure A9: Impact of the pension reform on the adjusted divorce incidence: Excluding April data (for couples married 20 to 24 yrs. and married 15 to 19 yrs.)

(a) Married 20 to 24 yrs



(b) Married 15 to 19 yrs.



Notes: Data are from the Vital Statistics on Divorces (Ministry of Health, Labour and Welfare). This figure presents the estimates of β_{1yl} in Eq. (15) for couples married for 20 to 24 years (A9(a)) and 15 to 19 years (A9(b)) when April data are excluded for all years, with estimates represented by the markers in the panel. The horizontal axis indicates fiscal years (y) from FY2002 to FY2010. Each panel presents the estimates for couples with a different marriage length (l). The figure focuses on couples where the primary earner was employed by a firm. Each coefficient estimate represents the difference in changes in the adjusted divorce incidence between couples married for less than 5 years and those married for longer from the reference year FY2003 to the other fiscal years. The number of observations used in the estimation is 3,240. The dashed lines indicate the 95% confidence intervals. Standard errors are clustered at the year-month (i.e., divorce date) level.

Theoretical Appendix

B.1 Utility maximization of single individuals

Single individuals maximize (2) subject to (4). Hereafter, the prime symbol $'$ denotes a first-order derivative. Let λ_i^s denote the Lagrange multiplier associated with (4). The first-order conditions of the resulting Lagrangian with respect to x_i^s, l_i^s, and q_i^s are given by

$$x_i^s : 0 = \varphi_i'(x_i^s) - \lambda_i^s, \quad i = m, f, \tag{17}$$

$$l_i^s : 0 = \phi_i'(1 - q_i^s - l_i^s) - w_i\lambda_i^s, \quad i = m, f, \tag{18}$$

$$q_i^s : 0 = \kappa_i'(q_i^s; n_i) - \phi_i'(1 - q_i^s - l_i^s), \quad i = m, f. \tag{19}$$

We denote allocations satisfying (4), (5) and (17)–(19) by

$$x_i^{s*}(z_i(\alpha), w_i, n_i), \quad l_i^{s*}(z_i(\alpha), w_i, n_i), \quad q_i^{s*}(z_i(\alpha), w_i, n_i), \quad i = m, f, \tag{20}$$

which yields the utility of the divorced single individual as $u_i^{s*}(z_i(\alpha), w_i, n_i) = u_i^s(x_i^{s*}(\cdot), l_i^{s*}(\cdot), q_i^{s*}(\cdot))$.

B.2 Utility maximization of couples

Couples maximize (6) subject to (7). Let λ^c denote the Lagrange multiplier associated with (7). The first-order conditions of the resulting Lagrangian with respect to x_i^c, l_i^c, and q_i^c are given by

$$x_i^c : 0 = \gamma_i\varphi_i'(x_i^c) - \lambda^c, \quad i = m, f, \tag{21}$$

$$l_i^c : 0 = \gamma_i\phi_i'(1 - q_i^c - l_i^c) - w_i\lambda^c, \quad i = m, f, \tag{22}$$

$$q_i^c : 0 = \gamma_i \cdot \left(-\phi_i'(1 - q_i^c - l_i^c) + \frac{\kappa_i'(q_i^c; n_i)}{\theta}\right) + \gamma_j\frac{\kappa_i'(q_i^c; n_i)}{\theta}, \quad i = m, f. \tag{23}$$

From (7)–(23), we obtain the equilibrium allocations in marriage:

$$x_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta), \quad l_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta), \tag{24}$$
$$q_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta), \quad i = m, f.$$

Spouses' allocations depend on their partners' parameters but are independent of the pension benefit division parameter α, owing to the couple's unified budget under collective decision-making. Substituting (24) into (5) yields $u_i^{c*}(z, w_m, w_f, n_m, n_f, \gamma_m, \gamma_f, \theta) = u_i^c(x_i^{c*}(\cdot), l_i^{c*}(\cdot), q_m^{c*}(\cdot), q_f^{c*}(\cdot))$, which also is independent of α, unlike the utility of single individuals.

B.3 Numerical analysis

When $\rho = \delta = \sigma \equiv 0.5$ in (10)–(12), the first-order conditions for single individuals, (17)–(19), reduce to

$$t_i^2 \cdot (x_i^s)^{-1} = (\lambda_i^s)^2, \quad i = m, f, \tag{25}$$

$$g_i^2 \cdot (1 - q_i^s - l_i^s)^{-1} = w_i^2 \cdot (\lambda_i^s)^2, \quad i = m, f, \tag{26}$$

$$v_i^2 n_i \cdot (q_i^s)^{-1} = g^2 \cdot (1 - q_i^s - l_i^s)^{-1}, \quad i = m, f. \tag{27}$$

From (4) and (25)–(27), we obtain

$$x_i^s = \frac{(z_i + w_i)\, w_i^2 t_i^2}{(g_i^2 + w_i t_i^2 + v_i^2 n_i)\, w_i}, \quad i = m, f, \tag{28}$$

$$q_i^s = \frac{(w_i + z_i)\, v_i^2 n_i}{(g_i^2 + w_i t_i^2 + v_i^2 n_i)\, w_i}, \quad i = m, f, \tag{29}$$

$$l_i^s = \frac{w_i^2 t_i^2 - (v_i^2 n_i + g_i^2)\, z_i}{(g_i^2 + w_i t_i^2 + v_i^2 n_i)\, w_i}, \ i = m, f. \tag{30}$$

When $\rho = \delta = \sigma \equiv 0.5$ in (10)–(12), the first-order conditions in marriage, (21)–(23), reduce to

$$\gamma_i^2 t_i^2 \cdot (x_i^c)^{-1} = (\lambda^c)^2, \quad i = m, f, \tag{31}$$

$$\gamma_i^2 g_i^2 \cdot (1 - q_i^c - l_i^c)^{-1} = (w_i)^2 (\lambda^c)^2, \quad i = m, f, \tag{32}$$

$$\left(\frac{v_i}{\theta}\right)^2 n_i \cdot (q_i^c)^{-1} = (\gamma_i)^2 g_i^2 \cdot (1 - q_i^c - l_i^c)^{-1}, \quad i = m, f. \tag{33}$$

(7) and (31)–(33) yield

$$x_i^c = \frac{\gamma_i^2 (w_m + w_f + z) w_f w_m t_i^2}{\left(\frac{v_m^2}{\theta^2} n_m + \gamma_m^2 g_m^2\right) w_f + \left(\frac{v_f^2}{\theta^2} n_f + \gamma_f^2 g_f^2\right) w_m + \left(\gamma_m^2 t_m^2 + \gamma_f^2 t_f^2\right) w_m w_f}, \quad i = m, f, \tag{34}$$

$$q_i^c = \frac{\frac{v_i^2}{\theta^2} n_i (w_m + w_f + z) w_j}{\left[\left(\frac{v_m^2}{\theta^2} n_m + \gamma_m^2 g_m^2\right) w_f + \left(\frac{v_f^2}{\theta^2} n_f + \gamma_f^2 g_f^2\right) w_m + \left(\gamma_m^2 t_m^2 + \gamma_f^2 t_f^2\right) w_m w_f\right] w_i}, \tag{35}$$

$$i, j = m, f \text{ and } i \neq j,$$

$$l_i^c = 1 - \frac{\left(\frac{v_i^2}{\theta^2} n_i + \gamma_i^2 g_i^2\right) (w_m + w_f + z) w_j}{\left[\left(\frac{v_m^2}{\theta^2} n_m + \gamma_m^2 g_m^2\right) w_f + \left(\frac{v_f^2}{\theta^2} n_f + \gamma_f^2 g_f^2\right) w_m + \left(\gamma_m^2 t_m^2 + \gamma_f^2 t_f^2\right) w_m w_f\right] w_i}, \tag{36}$$

$$i, j = m, f \text{ and } i \neq j.$$

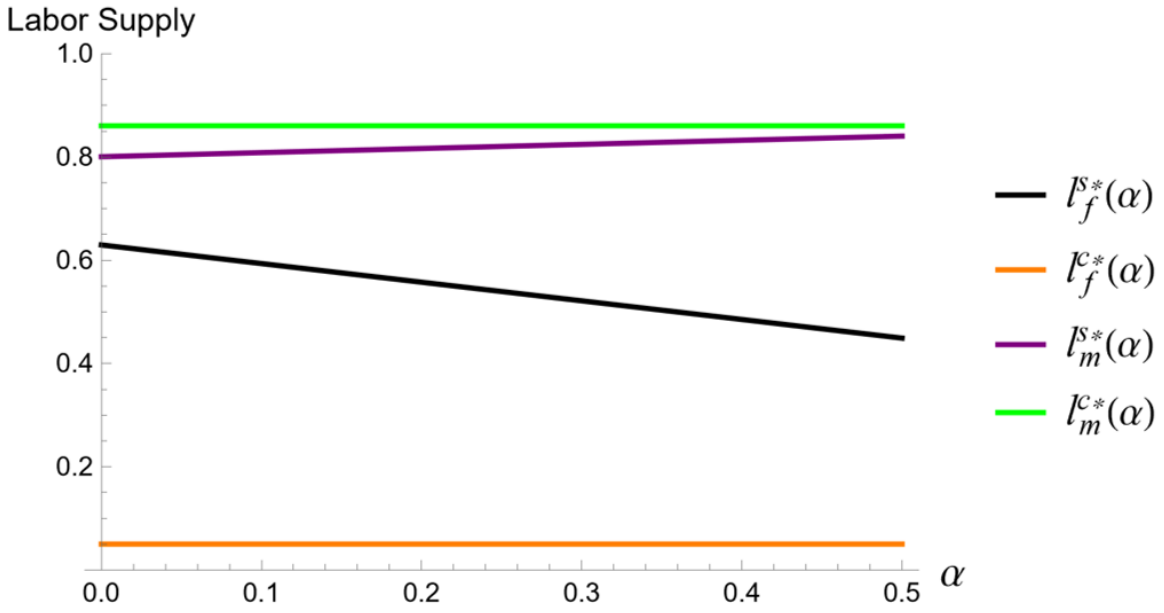
Substituting (28)–(30) into (2) yields the utility function for a single individual, while substituting (34)–(36) into (2) yields the utility function for each spouse of a married couple. Using the parameter values provided in Section 3.2, Figures 3(a) and 3(b) depict the relationship between the utility of the wife and husband and the pension division ratio α.

B.4 Labor supply and contribution to household production

We present the amount of labor supply and contribution to household production, based on the parameter values in Section 3.2. In Figure B1, the vertical axis rep-

resents the amount of labor supply, and the horizontal axis represents the pension division ratio. Specifically, Figure B2 depicts the husband's and wife's contribution to household production on the vertical axis and the pension division ratio on the horizontal axis. Figure B1 shows that the wife's labor supply at marriage is at a very low level, while her contribution to household production is at a high level. This is due to the assumption that the wife's productivity in household production is much higher than the husband's. The wife's and the husband's labor supply and their contribution to household production are all positive for $\alpha \in [0, 0.5]$.

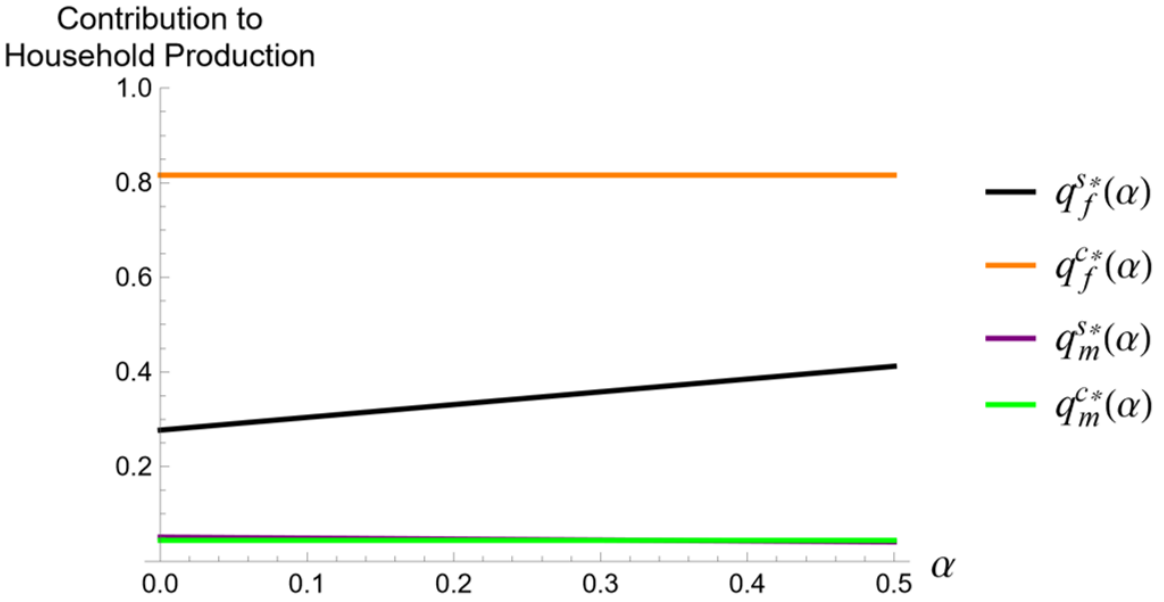
Figure B1: Labor supply



B.5 Endogenous bargaining power

In the theoretical analysis in Section 3, the bargaining power between spouses is assumed to be constant. However, even when the wife initiates divorce following pension division, if the husband accepts a reduction in his bargaining power, it is possible that the wife may choose to continue the marriage. This implies there is room for compromise—down to the level of reservation utility, namely the utility level after pension division—to maintain the marriage. It is therefore necessary to consider a

Figure B2: Contribution to household production



model in which bargaining power is endogenously determined, that is, can adjust up to the reservation utility level.

In this appendix, we present a case in which, even with endogenous bargaining power, the wife chooses divorce as a result of pension division. Specifically, we consider a situation where the couple's utility point before pension division lies inside the utility possibility frontier (UPF)– defined by varying the bargaining power from 0 to 1 – whereas after pension division, the point lies outside this frontier. In such a case, the couple remains married prior to pension division but decides to separate afterward. To make the results clearer, we introduce match quality into the analysis.

The model follows the numerical analysis in Section 3. The parameters are set as follows: $b_m = 0.5$, $b_f = 0.05$, $v_m = 2.9$, $v_f = 4.2$, $t_m = 9.5$, $t_f = 5.5$, $g_m = 1$, $g_f = 1.3$, $\theta = 1.5$, $w_m = 0.52$, $w_f = 0.42$, $n_m = 0.15$, $n_f = 0.3$, $\varepsilon_m = 2.4$, and $\varepsilon_f = -2.05$.

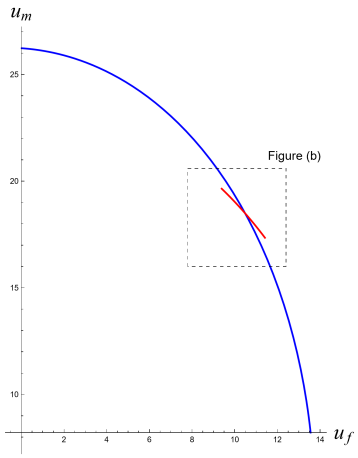
Under these parameters, the UPF for the married couple is illustrated by the blue curve in Figure B3(a). Figure B3(b) provides a zoomed-in view of the outlined area in Figure B3(a). The vertical axis represents the husband's utility level, while the horizontal axis represents the wife's utility level. In Figure B3(b), point A indicates the

couple's utility levels before the introduction of the new pension division rule, while Point B shows the levels after that. The red curve represents the combinations of utility levels as the pension division ratio α varies from 0 to 0.5. The segment between points C and D on the UPF indicates that marriage improves at least one spouse's utility. However, since Point B lies outside the UPF, this suggests that, regardless of how bargaining power is adjusted after pension division, the couple chooses divorce.

Figure B4 shows the labor supply and housework time of the individuals post-divorce (i.e., as singles), while Figure B5 displays the same variables for the married couple. In both cases, these values are positive.

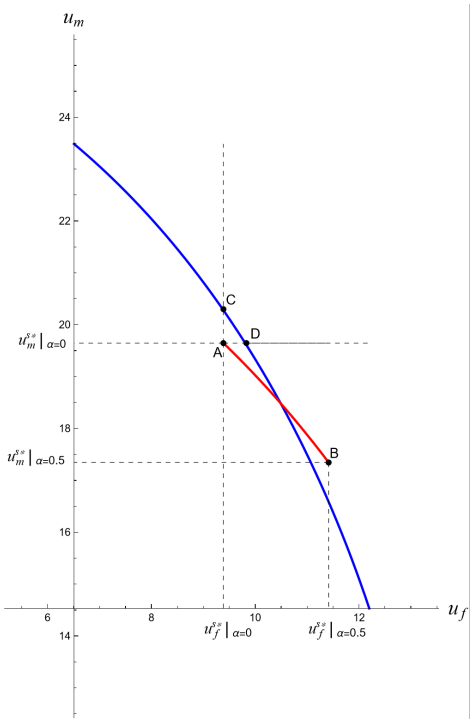
Figure B3: Husband's and wife's utility levels: Married vs. single

(a) Full view



Notes: The vertical axis represents the husband's utility level, and the horizontal axis the wife's. The blue curve depicts the utility possibility frontier (UPF) for the married couple, obtained by varying the bargaining power γ from 0 to 1. The red curve shows the combinations of utility levels as the pension division ratio α varies from 0 to 1.

(b) Zoomed-in view



Notes: This figure presents an enlarged view of the outlined area in Figure B3(a). Point A represents the spouses' utility levels in the event of divorce prior to pension division, while Point B marks their utility levels after pension division.

Figure B4: Labor supply and household production after divorce

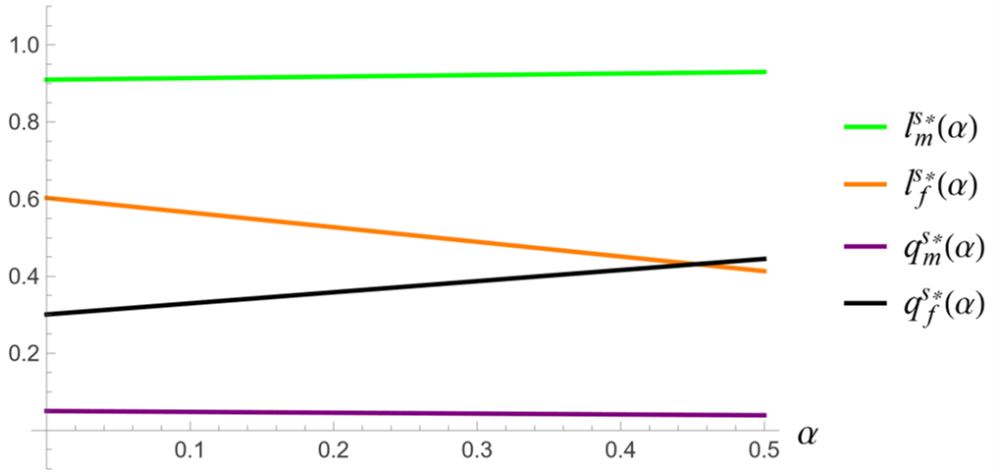


Figure B5: Labor supply and household production within marriage